

FM2000A
Amplifier Package

User's Manual

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Important Notices

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Crown attempts to provide information that is accurate, complete, and useful. Should you find inadequacies in the text, please send your comments to the following address:

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Section 1—Getting Acquainted

This section provides a general description of the FM2000A power amplifier system and introduces you to safety conventions used within this document. *Review this material before installing or operating the amplifier and power supply.*

1.1 Your Amplifier Package

The FM2000A is a highly efficient amplifier package designed to set a new standard in FM transmitter design offering modularity, ease of use, and long-term reliability. The FM2000A package includes a PA2000 amplifier, PS2000 power supply, and an FM2K accessory pack.

The PA2000 broadband amplifier requires no tuning and typically provides 80% RF efficiency across the band. The PS2000 power supply is power factor corrected and 90% efficient. Modern MOSFET technology ensures high AC to RF efficiency (better than 70% overall) and long-term reliability. The unmatched efficiency of this power amplifier significantly improves your bottom line by providing cooler operation and lower power costs.

These modular units are uniquely designed to be lightweight and compact for convenient shipping, and require only seven RU spaces for installation. Installation is made simple with just three interconnections between the amplifier and power supply. In addition, built-in digital metering and status indicator capabilities enable intuitive operation to further augment the user-friendly design.

Economic long-term reliability is ensured through our carefully engineered solid-state design. The PA2000 features four field-replaceable 500–watt power modules.

This power amplifier delivers 500 to over 2000 watts of RF power output. Use your existing exciter or purchase the FM2000T which includes our award-winning FM100 exciter for an unbeatable 2 kW transmitter package.

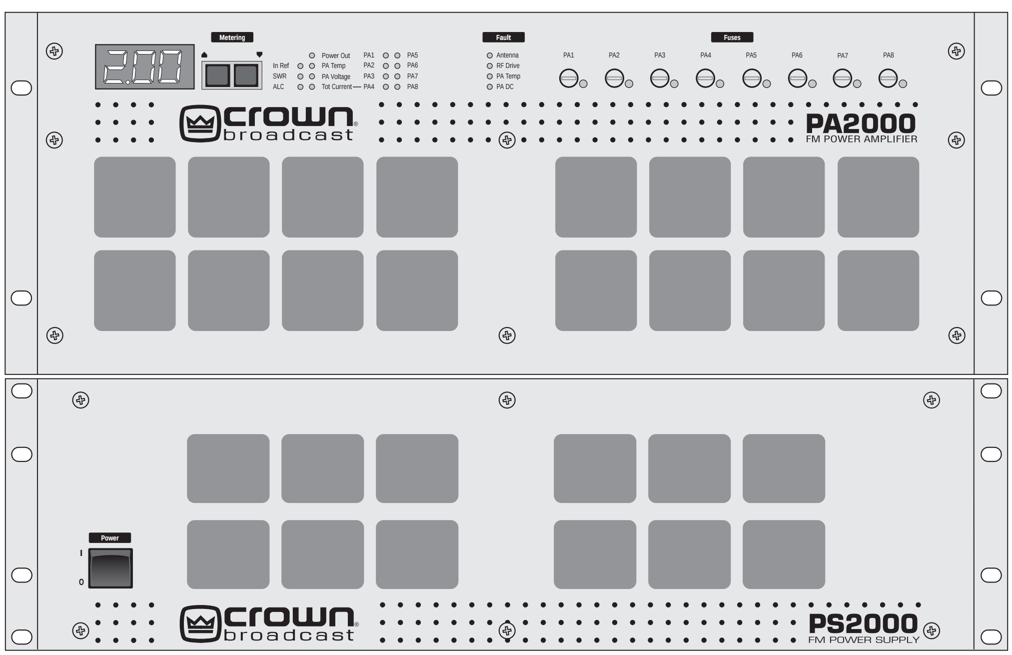


Illustration 1–1 FM2000A Amplifier Package

1.2 Amplifier Package Specifications

RF Power Output:	200 to 2200 watts continuous with controlled power adjust, with remote controlled power capability
RF Drive Requirement:	50-70 watts for full output
RF Output Impedance:	50 watts (unbalanced)
Maximum SWR:	1.7:1 (With power foldback at high SWR)
Frequency Range:	87–108 MHz
RF Harmonics/Spurious Products:	Better than –80 dB
Asynchronous AM S/N Ratio:	Better than 55 dB with 100% modulation @ 400 Hz, no de-emphasis, no FM modulation (typically > 60 dB)
Synchronous AM S/N Ratio:	Better than 55 dB with 100% modulation @ 400 Hz, no de-emphasis, FM modulation = 75 kHz @ 400 Hz (typically > 60 dB)
Operating Environment:	
Temperature Range:	0°–50°C at sea level
Humidity Range:	0–80% at 20°C, noncondensing
AC Power:	240 volts AC +10/-15%, 50–60 Hz
Power Consumption:	2800 watts at 2000 watts RF output typical
Power Factor:	.96 typical
Overall Efficiency:	70% typical
RF Output Connector:	7/8 inch EIA flange, 7–16 inch DIN optional
Power Amplifier Chassis:	7 x 17.25 x 23 inches (17.78 x 43.82 x 58.42 cm) exclusive of rack ears, but inclusive of connectors
Power Supply Chassis:	5.25 x 17.25 x 23 inches (13.34 x 43.82 x 58.42 cm) exclusive of rack ears
Weight:	PA2000—57.5 pounds (26.1 kg) RF PA Modules —8 pounds (3.6 kg) each PS2000—43 pounds (19.5 kg)

Note: *System performance is specified using Crown Broadcast Model FM100 Exciter where applicable.*

1.3 Safety Considerations

Crown Broadcast assumes the responsibility for providing you a safe product and safety guidelines during its use. “Safety” means protection to all individuals who install, operate, and service the transmitter as well as protection of the transmitter itself. To promote safety, we use standard hazard alert labeling on the product and in this manual. Follow the associated guidelines to avoid potential hazard.

1.3.1 Dangers

DANGER represents the most severe hazard alert. Extreme bodily harm or death <u>will</u> occur if DANGER guidelines are not followed.

1.3.2 Warnings

WARNING represents hazards which <u>could</u> result in severe injury or death.

1.3.3 Cautions

CAUTION indicates potential personal injury or equipment or property damage if the associated guidelines are not followed. Particular cautions in this text also indicate unauthorized radio-frequency operation.

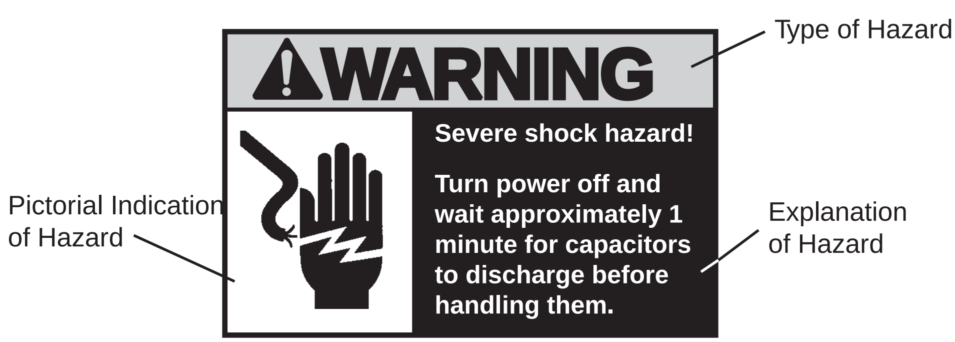
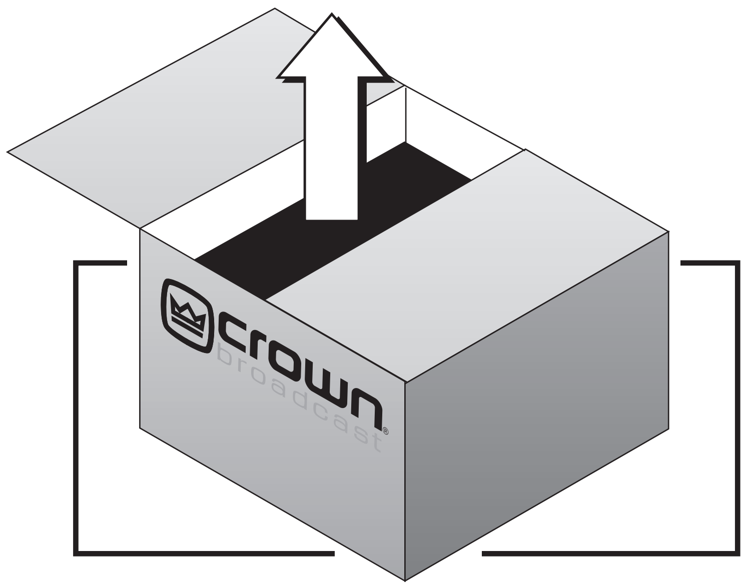
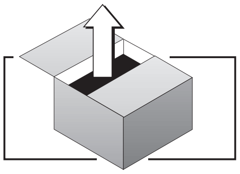


Illustration 1–3 Sample Hazard Alert



Section 2—Installation

This section provides important guidelines for installing your power amplifier and power supply. Review this information carefully for proper installation.



2.1 Operating Environment

You can install the FM2000A amplifier system in a standard 19–inch component rack or on a suitable surface such as a bench or desk. In any case, the area should be as clean and well-ventillated as possible. The power supply must be installed directly above or below the power amplifier (for the included dressed cables to reach their respective connectors).

2.2 Tools Required

To install the power supply and power amplifier, you will need the following tools:

- ❑ Medium phillips screwdriver
- ❑ Medium flat-blade screwdriver
- ❑ Small flat-blade screwdriver
- ❑ 7/16–Inch wrench or nut driver
- ❑ ESD (Electrostatic Discharge) protection grounding strap and/or mat.

2.3 Unpacking

Before handling any exposed printed circuit boards, ground yourself with an antistatic strap and/or mat.

⚠ CAUTION

Possible equipment damage!
Guard against electrostatic discharge through electronic components.

The power amplifier, power supply, and two power amplifier modules are packed and shipped in individual boxes because of their modular nature. (The FM2K accessory kit is packed inside one of the two power amplifier module boxes.) For added protection, both the PA2000 amplifier and PS2000 supply are packed in an inner box and then placed inside an outer box with styrofoam protective corners in both boxes. You will need to unpack a total of four boxes (plus two inner boxes).

> ***Note:*** *Save the boxes and packaging material that the individual units are packed in should you need to return them for factory service.*



2.4 Preinstallation

2.4.1 Power Amplifier Modules

The PA2000 incorporates four power amplifiers (two each in two modules). Due to possible damage during shipment, the power modules have been removed. Follow these steps to install the modules:

1. Remove the front panel of the PA2000 (four screws).
2. Taking ESD precautions (see page 2–2), unpack the power modules and place them on your work area with the circuit sides up.

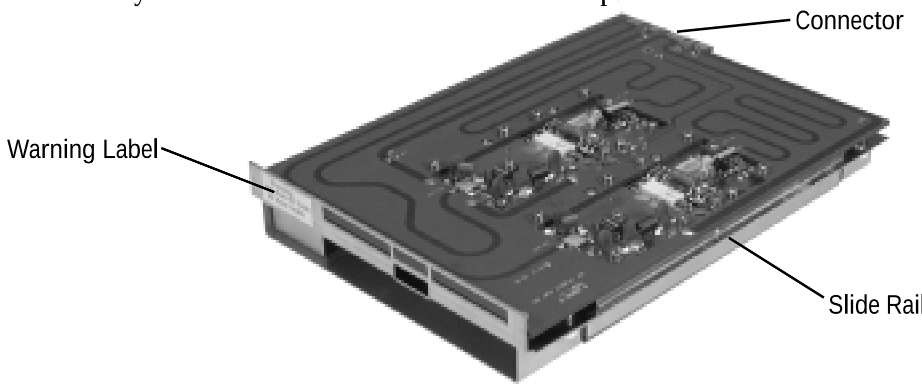


Illustration 2–1 Power Amplifier Module

3. The warning labels on the front of the modules should all be positioned to the center of the chassis, also note the position of the connector on the modules and in the chassis.
4. Insert the four power modules, using their slide rails, into the built in channels of the right-side cavity and two (upside down) in the left cavity as shown below. Note that the connectors and warning labels are nearest the middle wall or partition of the PA2000.

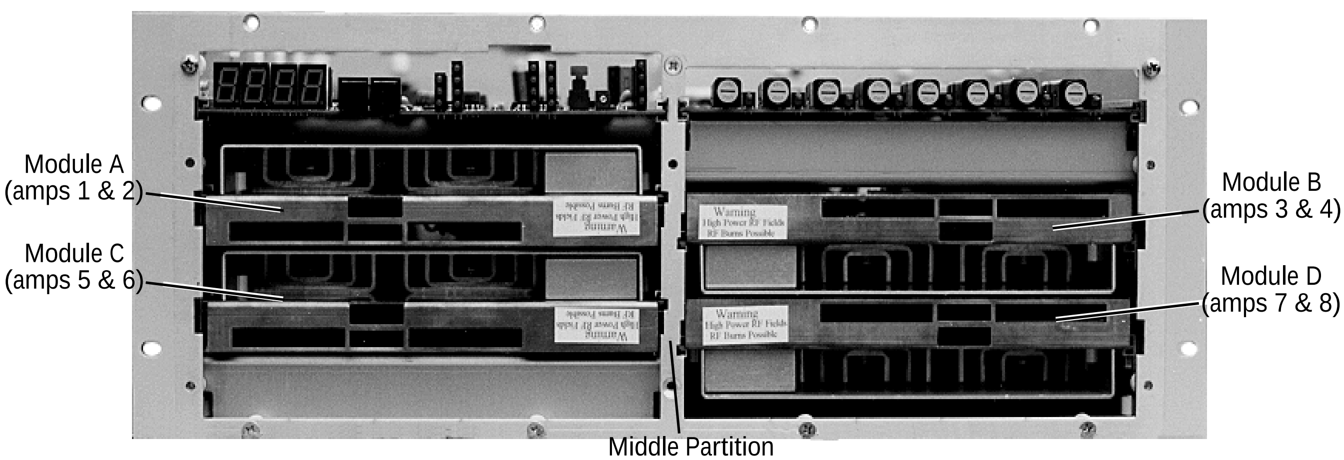
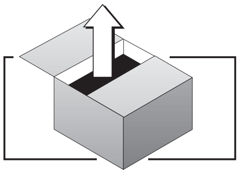


Illustration 2–2 Power Amplifier Module Placement

5. Be sure the modules are pushed in completely so that the connector makes proper contact.
6. Replace the front panel of the PA2000.



2.4.2 Hubble Twist Lock® Connector Wiring

Prepare the wiring for the Hubble Twist-Lock® connector in the following manner before connecting to your AC power source:

1. Use round cord with a diameter of 0.385–0.780 inches (10–20 mm), Type SJ 12/3 – 10/3; Type S 16/3 – 10/3.
2. Select conductor size from your National Electrical Code®.
3. Slide the cover onto the cord. Remove insulation from cable and conductors as shown in Illustration 2–3. Do not tin conductors.

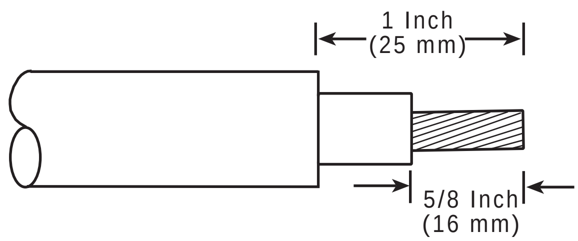


Illustration 2–3 Cover, Cable & Conductors

4. Loosen terminal screws. Insert conductors fully into proper terminals according to the table below. Take caution that there are no stray wire strands.

Terminal	Conductor
Green Hex Head Screw	Equipment grounding conductor (green or green/yellow)
Brass Screw	Hot circuit conductor, 240 VAC (NOT white, NOT green)
Brass/Black Screw	Hot circuit conductor, 240 VAC (NOT white, NOT green)

5. Tighten terminal screws to 18 pound•inches (2.1 N•m) of torque.
6. Tighten assembly screws to 10 pound•inches (1.1 N•m) of torque.
7. Tighten cord clamp screws to 10 pound•inches (1.1 N•m) of torque.

⚠WARNING

Possible Electric *Shock* Hazard!

Do not connect AC source until all other connections are made and installation is complete.

2.5 Installation

1. Mount the units in an appropriate 19–inch wide cabinet. The power supply must be installed directly below the power amplifier for the included cables to reach their respective connectors (see illustration 2–4 below).

   ***Note:** The PS2000 weighs approximately 43 pounds (19.5 kg); the PA2000, approximately 57.5 pounds (26.1). Use help to install.*

2. Ensure that the PS2000 power switch is off, the circuit breakers of the 240 VAC source on the back panel are off, and the AC connector is <u>not</u> plugged in.
3. Install the exciter source (such as a Crown Broadcast FM100) according to its instructions.
4. Connect the RF input cable from the exciter source to the N connector on the back of the PA2000.
5. Connect the RF output cable (from the antenna) to the 7/8 EIA or 7-16 DIN connector on the back of the PA2000.
6. Connect one end of the supplied control cable to the 9–pin D-sub connector on the PA2000.
7. Connect the other end of the control cable to the 9–pin D-sub connector on the PS2000.

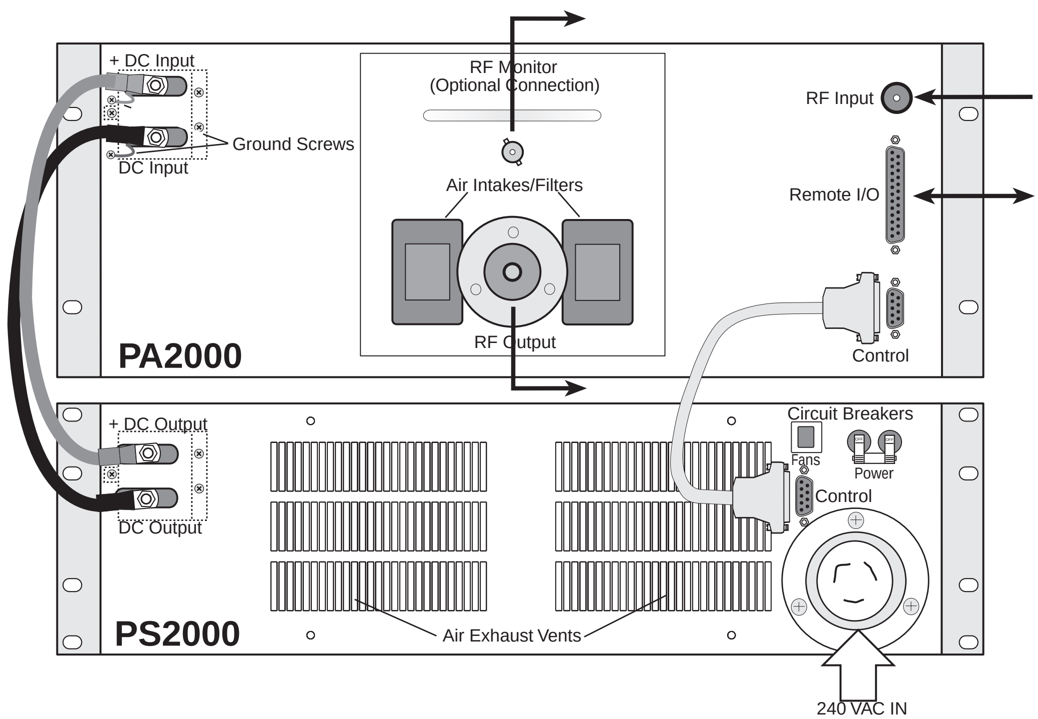


Illustration 2–4 Rear Panel Connections

8. Using the supplied connector, tie together pins 6 and 7 of the Remote I/O connector. The amplifier will not operate without this connection or a remote switch on these pins. *(See Section 2.6 for Remote I/O connection.)*
9. If monitoring of the output signal is desired, connect the RF monitor cable to the BNC connector on the PA2000.
10. Connect the DC input/output cables between the PA2000 and the PS2000 as illustrated (Illustration 2–4). The connector end with the ground lead connects to the PA2000. Be sure to attach the ground leads as indicated.

    Note: *The power lead shield is only grounded at the PA chassis.*

11. Install the covers over the DC terminals of the PA2000 and the PS2000 using hardware form the hardware kit (1/4–inch X 6–32 bolts with lock washers).
12. Connect to your AC power source by inserting the Hubble Twist-Lock connector into the female Hubble connector on the PS2000 and turn to the right until the connection locks.

2.6 Remote I/O Connection

The Remote I/O Connector on the back of the PA2000 allows remote control and monitoring of Certain transmitter functions. There are three basic *control* functions—AC on/off, RF power level adjustment, and RF down/off.

The **AC power on/off** remote control function, available at pin 7 of the Remote I/O Connector, turns DC power to the PA on when the pin is grounded.

The **RF power level adjustment** remote control function has an internal maximum limit set on the Metering and Control Board. The Local Power Adjust (R62) sets the maximum limit of RF power output. The limit is set by placing the Remote/ Local switch (SW5) in the LOCAL position and adjusting the Local Power Adjust to your desired maximum limit (see illustrations 2–5 and 2–6). However, for any remote operation to work, the Remote/Local slide switch must be in the REMOTE position. Then the on-board remote RAISE and LOWER push buttons and any external remote switches attached to pins 4 and 15 of the I/O Connector can adjust

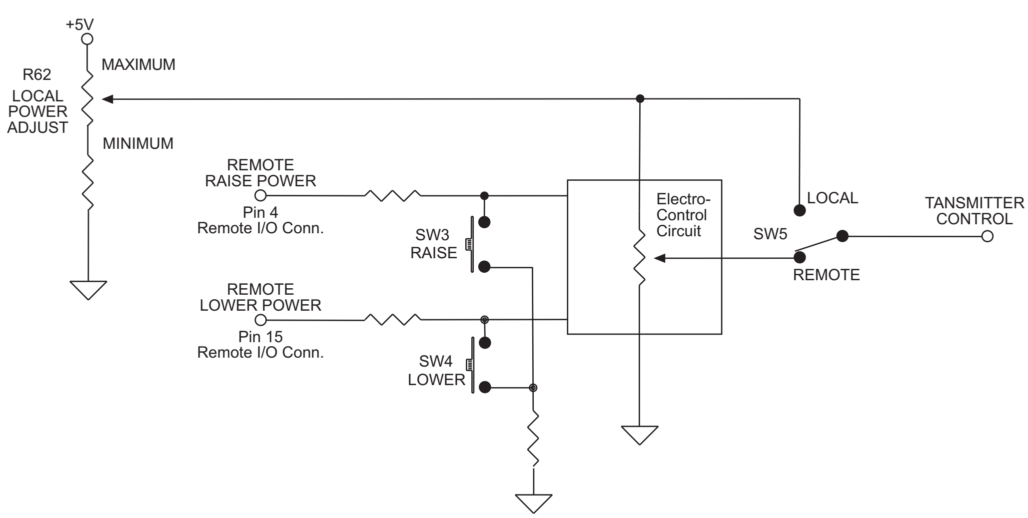


Illustration 2–5 Local and Remote Functions

the level up to that limit and down to zero. When a specific output power level is set, the Metering and Control Board controls and maintains the setting to keep the power constant. The location of the Local Power Adjust (R62), the on-board Raise and Lower switches (SW3 & SW4), and the Local/Remote slide switch (SW5) are shown below.

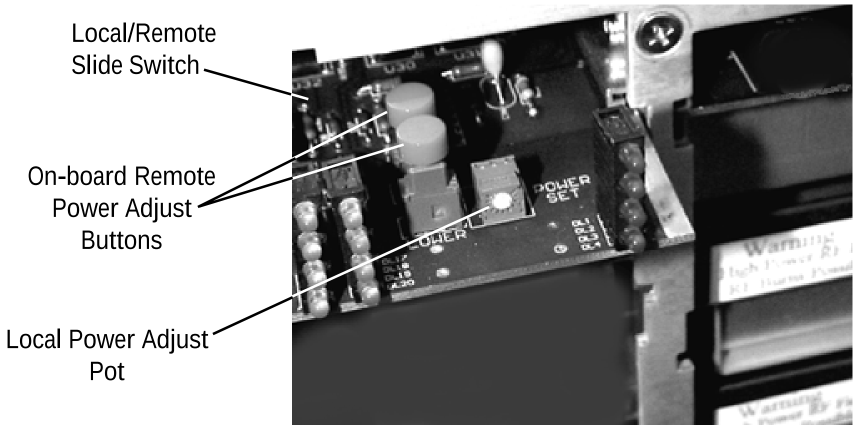


Illustration 2–6 On-board Remote Power & Related Controls

Another remote control function, available at pin 5 of the Remote I/O Connector, turns **RF down/off**. Connecting this pin to ground through a resistor allows the RF power output level of the amplifier to be reduced below the internal limit set by the Local Power Adjust pot or the remote Raise/Lower settings. However, some drive power, less than one watt, may still be present at the antenna. Depending on the resistor used, this pin can serve as a control for optional low power operation.

The remaining remote functions are for *monitoring* the various parameters of the PA2000. They are either buffered metering outputs, direct reading, or latched high/low indications. Further details of these functions are described in the pin-out table on page 2–8.

Note: *If Remote I/O controls are not used, tie pin 7 to pin 6 (GND.).*

For remote I/O (Input/Output) connection, connect your remote I/O cable from your remote control location to the 25–pin (female) D-sub connector on the back panel of the PA2000. The I/O Connector on the power amplifier is described in the following diagram:

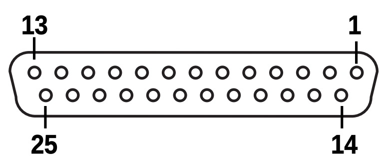


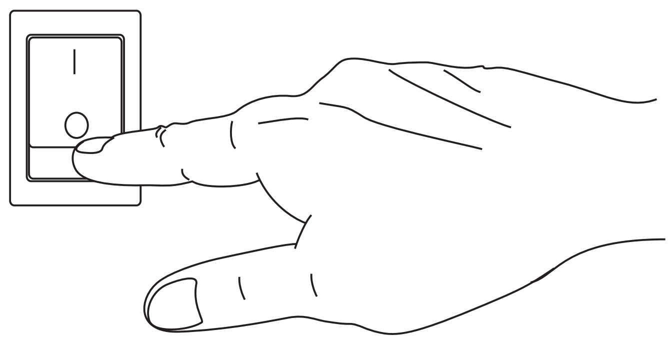
Illustration 2–7 Remote I/O connector (back panel view)

The Remote I/O Connector Pinout Table on the next page summarizes the Remote I/O pin connections.

Pin #	Function
1	PA#8 Current Monitor (a buffered metering output with 1 V = 2 A)
2	PA#7 Current Monitor (a buffered metering output with 1 V = 2 A)
3	Ground
4	Remote RAISE Power (a momentary switch, on this pin, when held low will raise the power level 10 watts every 0.5 seconds)
5	Remote RF Power Control (a resistor to ground on this pin reduces RF power output level below internal limits. See Section 2.6, page 2–7)
6	Ground
7	Remote AC Power On (a latching switch, on this pin, when held low will turn the AC power supply on)
8	Fault Summary (the voltage from this pin goes to +5 V if any fault occurs and drops below 2V when the fault goes away)
9	Ground
10	ALC (the voltage from this pin is a direct reading of automatic level control voltage, not buffered)
11	PA Temperature (a buffered metering output with 1 V = 20° C)
12	SWR (a buffered metering output with a calculated reading of standing wave ratio in VDC)
13	RF Output Power (a buffered metering output with a calculated reading of output power of 1 V = 1000 W)
14	Input Power Reference (a buffered metering output with a DC voltage representing input power)
15	Remote LOWER Power (a momentary switch, on this pin, when held low will lower the power level 10 watts every 0.5 seconds)
16	PA#6 Current Monitor (a buffered metering output with 1 V = 2 A)
17	PA#5 Current Monitor (a buffered metering output with 1 V = 2 A)
18	Ground
19	PA#4 Current Monitor (a buffered metering output with 1 V = 2 A)
20	PA#3 Current Monitor (a buffered metering output with 1 V = 2 A)
21	Ground
22	PA#2 Current Monitor (a buffered metering output with 1 V = 2 A)
23	PA#1 Current Monitor (a buffered metering output with 1 V = 2 A)
24	PA Total Current Monitor (a buffered metering output with 1 V = 20 A)
25	PA Volts (a buffered metering output with 1 V = 10 V)

Note: *PA = Power Amplifier*

Remote I/O Connector Pinout Table



Section 3—Operation

This section provides general operating parameters of your power amplifier system and a detailed description of the front panel display.

3.1 Initial Power-up Procedures

These steps summarize the operating procedures you should use for the initial operation of the power amplifier and power supply of the FM2000A.

1. Ensure that the external remote control unit is properly connected (See Section 2.6 and the pin-out description table on page 2–8 for proper pin configuration). If not using a remote control unit, pin 7 must be tied to ground pin 6.
2. Connect Antenna.
3. If using an external remote control, enable the power supply via the remote I/O connector.
4. Turn on (set to up) the AC input circuit breaker located on the rear panel of the power supply (do not turn on the front panel power switch yet).

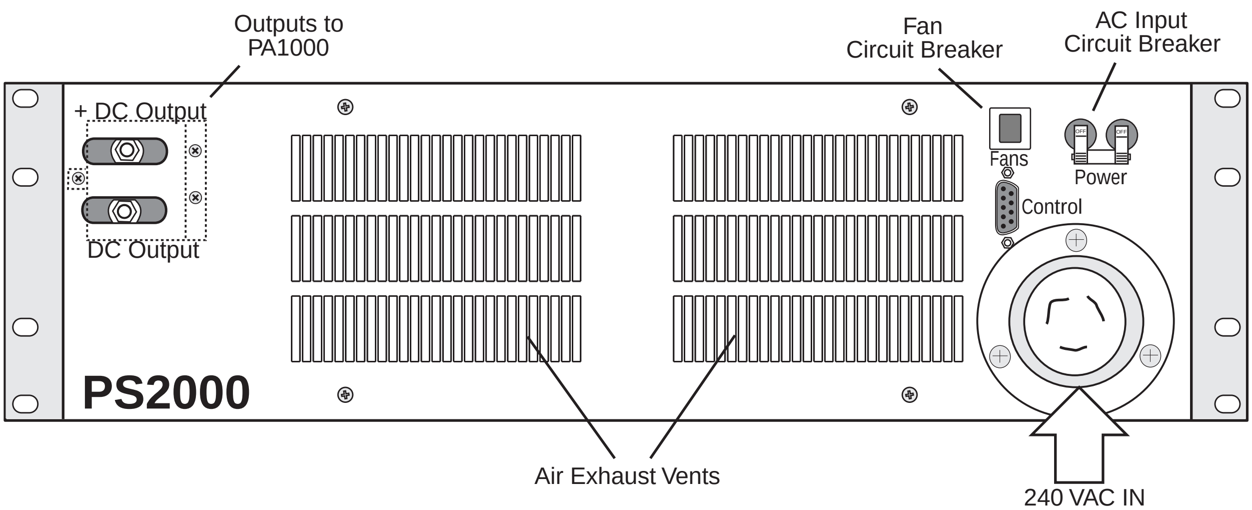


Illustration 3–1 PS2000 Back Panel Functions

5. Turn on the exciter (a Crown FM100 or equivalent) and adjust its RF power output level until the In Reference (In Ref) voltage, as indicated on the PA2000 front panel Digital Multimeter, is between 0.8 and 1.2 volts. This is not a drive dependent amplifier; therefore drive must be at a constant level regardless of main output power.

Note: *The unit will not operate until the exciter is active and produces sufficient drive.*

6. Before power-up, place the Local/Remote switch (located on the Metering & Control board behind the front panel) in the Local position and adjust the output power limit to the mid-level position using the Local Power Adjust, also on the Metering & Control board (see Illustration 3–2 below). The unit is normally shipped with this setting. See Section 2.6 for setting up remote operation and using the on-board remote buttons and other controls.

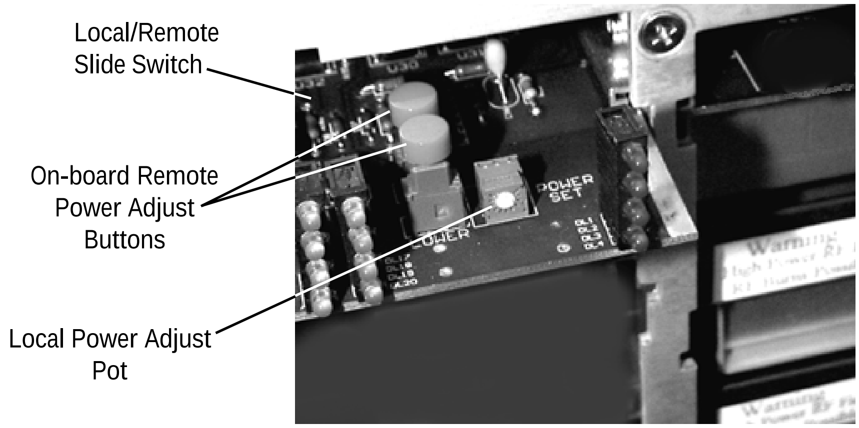


Illustration 3–2 Local Power Adjust and Other Controls

7. Turn on the main power switch located on the front panel of the power supply. (The unit typically takes 30 seconds to power up.)

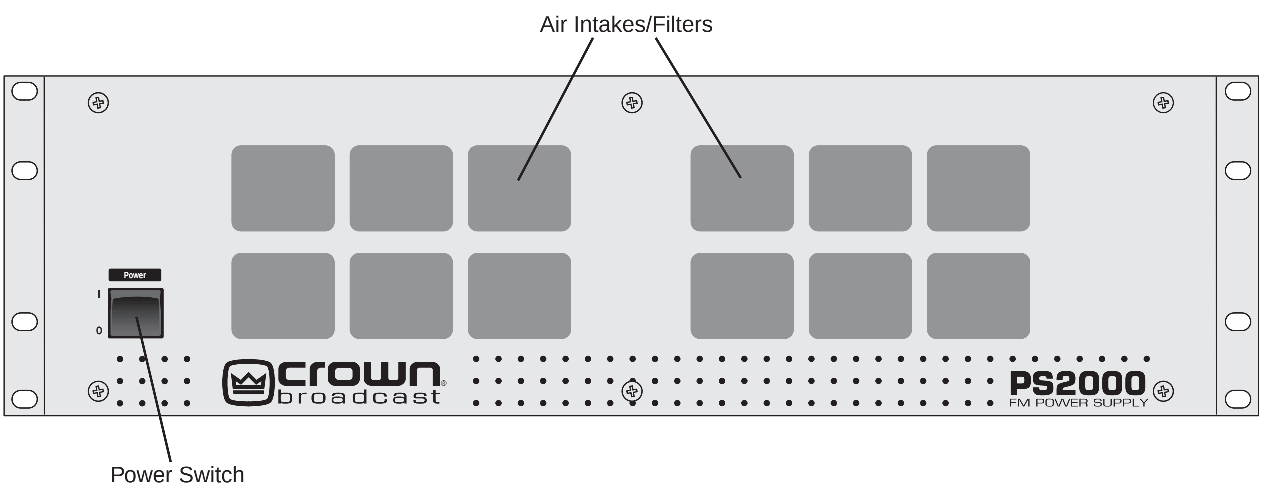


Illustration 3–3 PS2000 Front Panel Functions

8. Check the PA2000 parameters with the Digital Multimeter for a current (Tot Current) of 42 to 48 amps and a voltage (PA Voltage) of 32 to 36 volts. If parameters are within range, increase the Local Power Adjust to the maximum level of desired operation.

   Note: *The Local Power Adjust pot is unconventional (CW lowers power).*

9. Place the Local/Remote switch (see Illustration 3–2) in the Remote position and, using an external remote control unit connected to the Remote I/O connector or the on-board remote Raise/Lower buttons, adjust the PA2000 to the maximum power set by the Local Power Adjust. (This prevents adjusting to higher than permitted power levels.)

10. Verify that the following conditions are present as indicated by the PA2000's Digital Multimeter:

    a. In Ref—Should read between 0.4 and 0.8 volts (0.5 nominal, dependent upon power input level).
    b. SWR—Should read 1.05 to 1.5.
    c. ALC—Should read between 4.00 and 6.00 volts for 2.2 kW output (less for lower output or danger conditions, i.e. high SWR).
    d. Power Out—Should read 2.20 for 2.2 kW output.
    e. PA Temp—Should read 35 to 50°C with ambient temperature of 25°C.

The remainder of this section describes the functions of the front and rear panel indicators and switches of the PA2000 and PS2000.

3.2 Power Switches

3.2.1 AC Input Circuit Breaker

The PS2000 supplies power to the PA2000 by converting single-phase 220/240 VAC into 50 VDC. The PS2000 is protected by a 20 A, double-pole circuit breaker located on the rear panel. This AC input circuit breaker must be in the "up" position (as shown below) for operation.

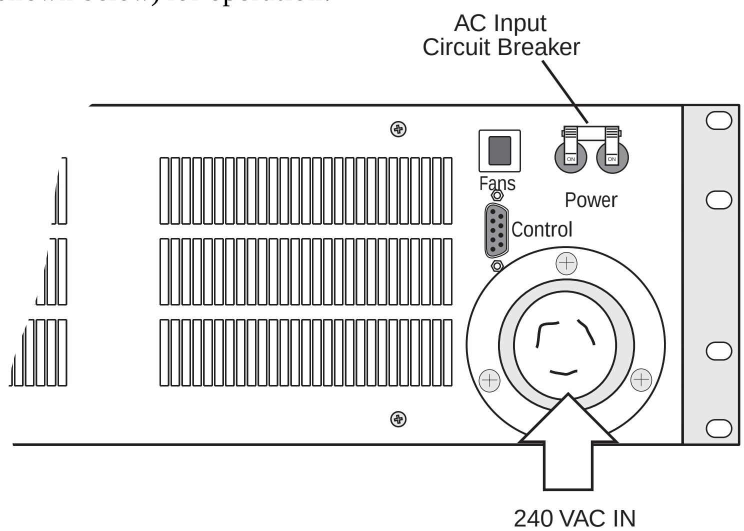


Illustration 3–4 AC Input Circuit Breaker

3.2.2 DC Power Switch

The main on/off power switch located on the front panel of the power supply controls high voltage output. (The control circuit activates this voltage.)

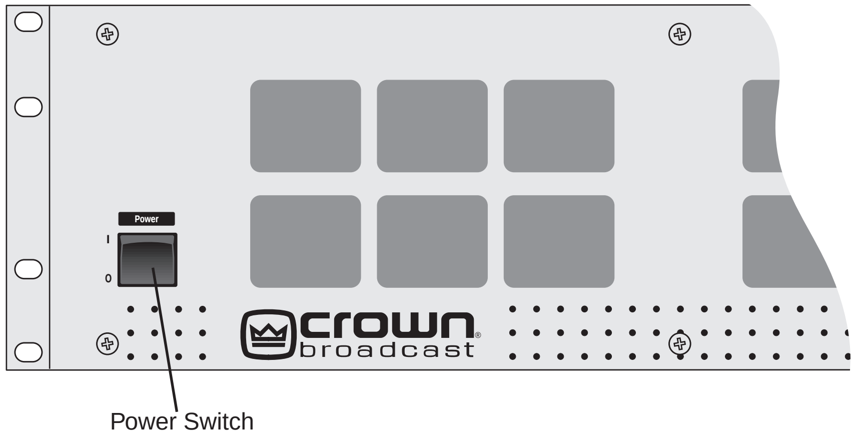


Illustration 3–5 DC Power Switch

3.2.3 Interlock Switch

This switch is located on the fan mounting bracket in the power supply. When the top cover of the power supply is removed, the Interlock Switch interrupts the power supply control circuit disabling the high and low voltage supplies.

⚠ WARNING	Lethal voltages are still present on the AC Input Board ! So, handle with care.

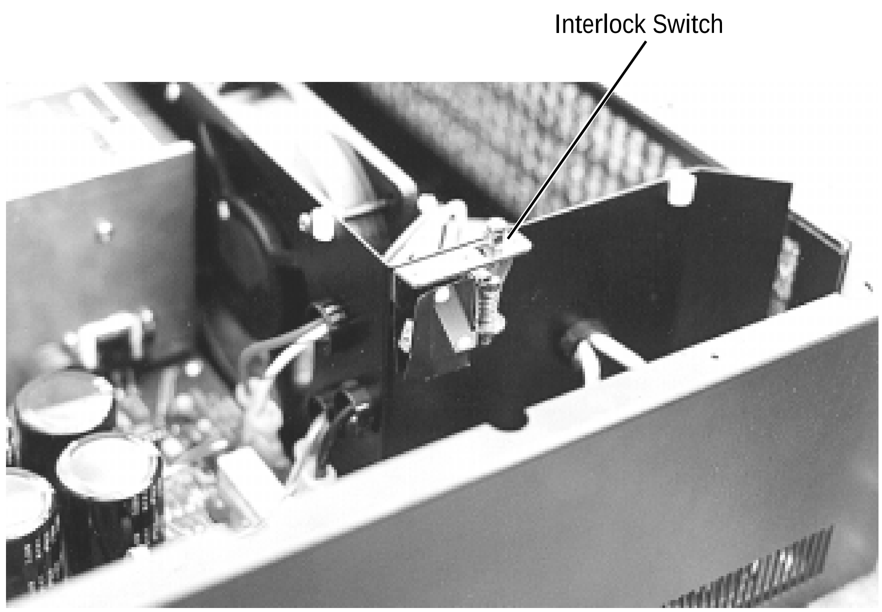


Illustration 3–6 Interlock Switch

3.3 Digital Multimeter

The 3–digit numeric display in the upper left corner of the front panel provides information on the amplifier’s operation. Use the “up” and “down” push-buttons to select one of the following parameters as indicated by a green LED.

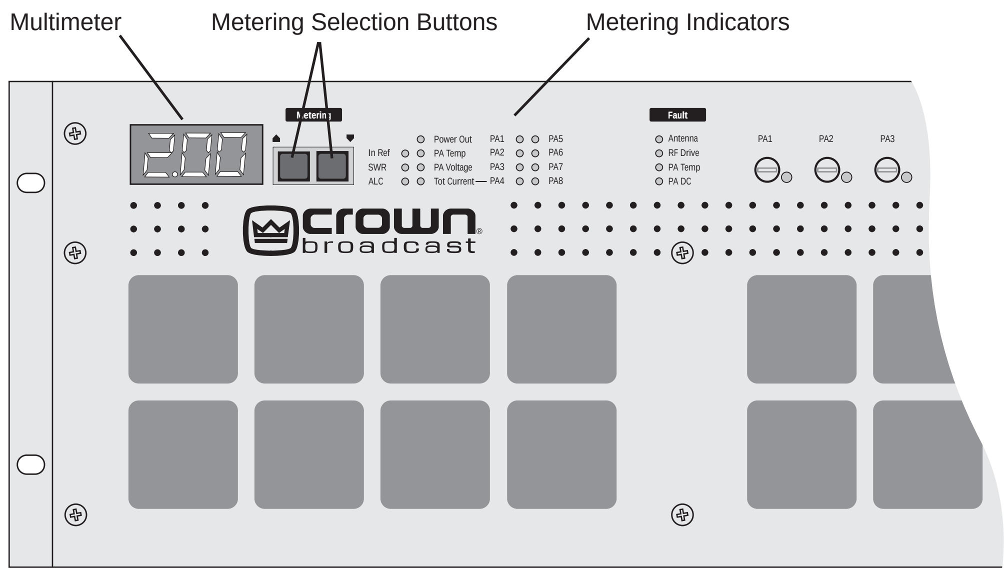


Illustration 3–7 Digital Multimeter

In Ref—Input reference is a relative voltage level used to determine input RF power level. This varies between frequency of operation and input power level.

SWR—Direct reading of the antenna Standing-Wave Ratio (the ratio of the actual load impedance to the desired 50 ohm load impedance).

ALC—Automatic level control is DC gain control bias used to regulate PA supply voltage. With the PA power supply at full output voltage, ALC will read about 6.0 volts. When the RF output is being regulated by the RF power control circuit, this voltage will be reduced, typically reading 5.0 to 6.0 volts. The ALC voltage will be reduced during PA DC overcurrent, SWR, or overtemperature conditions.

Power Out—Actually reads RF voltage squared, so the accuracy can be affected by SWR. Tolerance of ± 10% is normal. For exact set-up on site, an external power meter is recommended.

PA Temp—Highest temperature of all individual RF power amplifier heatsinks in degrees C.

PA Voltage—Supply voltage of the RF power amplifier.

Tot Current—Sum total current of all individual RF power amplifiers in amperes.

PA1–8—Individual RF amplifier current reading in amperes.

3.4 Fault Indicators

Faults are indicated by illuminated red LED's when the following occurs:

Antenna—Load SWR exceeds 1.5:1. ALC voltage is reduced to limit the reflected RF power.

RF Drive—Lack of or insufficient RF drive. If the RF drive fault LED is lit, input drive must be increased. To achieve full output power, 70–80 watts of input drive is required.

> **⚠ CAUTION**
>
> **Possible equipment damage!**
>
> **Do not exceed 80 watts of input drive. Damage to the PA2000 will result if this level is exceeded.**

PA Temp—PA heatsink temperature is greater than 75°C (power foldback will begin at this point).

PA DC—Power supply current for the PA (power amplifier) is at the preset limit, or there is a difference of more than 2.5 amps in current between the individual PAs. When this indicator is on ALC, the voltage is reduced automatically which holds the supply current to the preset limit.

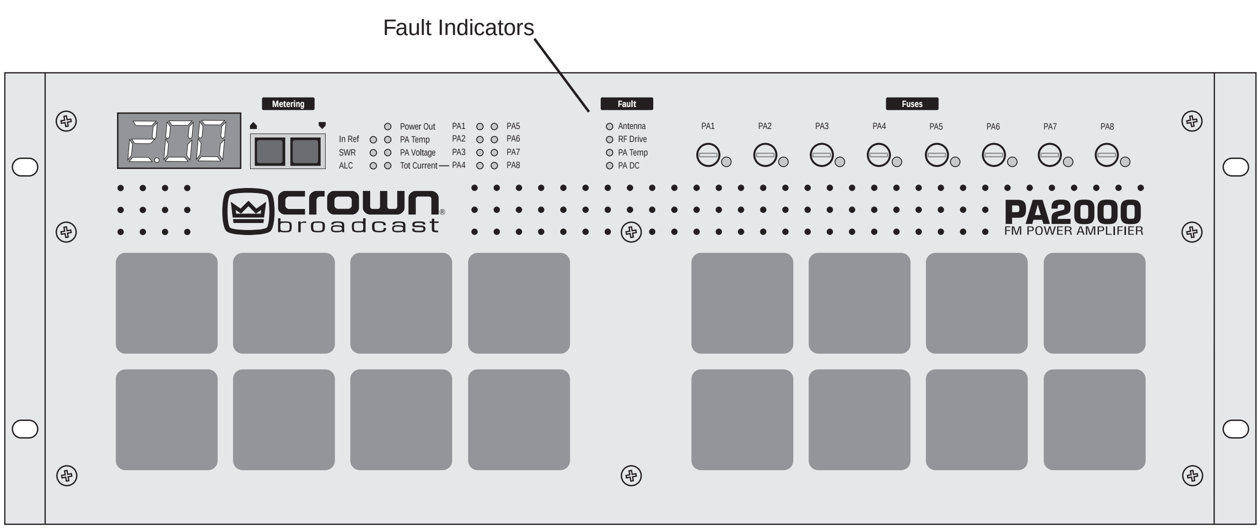


Illustration 3–8 Fault Indicators

3.5 Fuse Indicators

The PA2000 consists of four field-replacable power modules with two amplifiers in each module. If a module fails, it may be replaced while the unit continues to operate (at a reduction in output power).

Each of the paralleled amplifiers is protected by a 10 ampere fast-acting fuse. When a fuse opens, the indicator light next to it comes illuminates and built-in redundancy allows the unit to continue operation. The fuse can be replaced while the unit is operating. Fuses 1 and 2 represent amplifiers 1 and 2 on the top left module. Fuses 3 and 4 represent amplifiers 3 and 4 on the top right module. Fuses 5 and 6 represent amplifiers 5 and 6 on the lower left power module. Fuses 7 and 8 represent amplifiers 7 and 8 on the lower right power module.

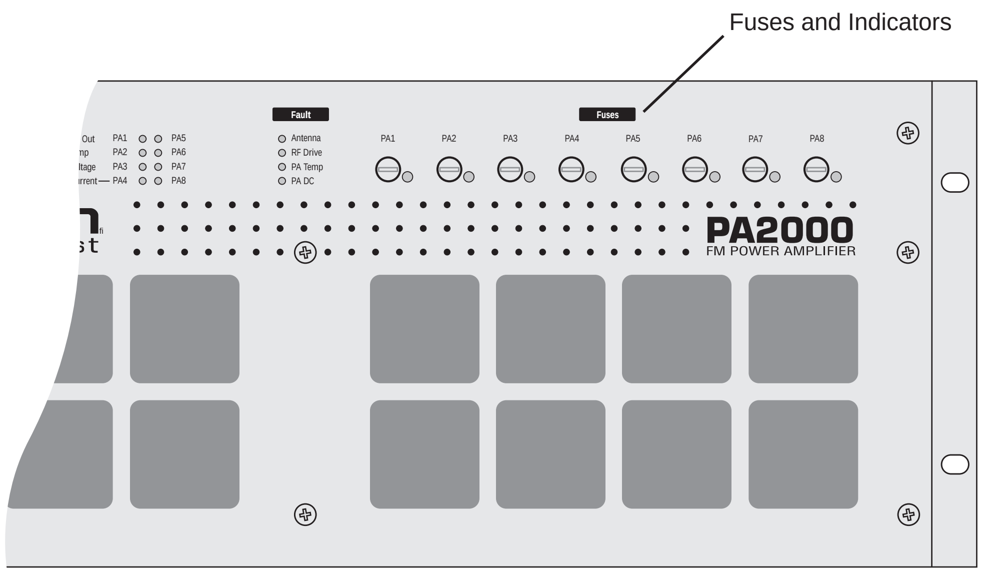
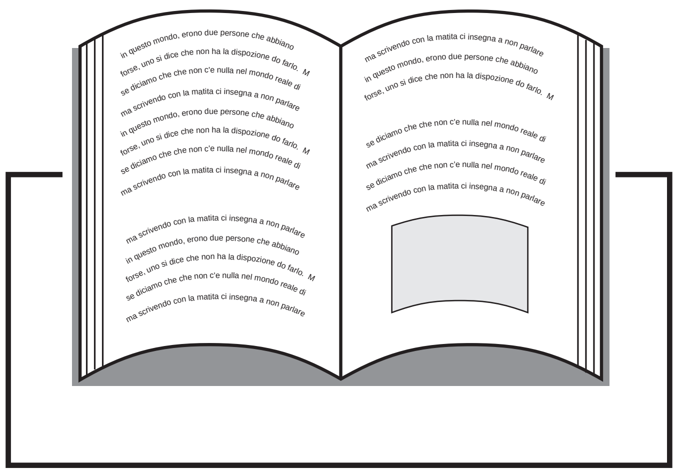


Illustration 3–9 Fuse Indicators



Section 4—Principles of Operation

This section discusses the circuit principles upon which the power amplifier and power supply function. This information is not needed for day-to-day operation, but may be useful for advanced users and service personnel.

Introduction

The FM2000A is a solid state RF amplifier package designed to deliver 500 to 2000 watts. The package consists of two separate, compact units—a power supply (PS2000) and a power amplifier (PA2000). In turn, these units consist of modular components which provide for efficient operation as well as ease-of-service.

4.1 PA2000 Power Amplifier

The PA2000 power amplifier features adjustable output to deliver 500–2000 watts of RF output power for broadcast transmission. The amplifier is broadband; no tuning is required. The design, however, ensures efficient operation. Typical RF efficiency is 75% to 85% across the FM band.

4.1.1 Power Modules

The primary components of the PA2000 are four, 500–watt power modules. These power modules are mounted by stacking two in the left cavity and two in the right cavity of the chassis.

The chassis of the power modules acts as a heat sink for the MOSFET amplifiers. There are two power amplifiers mounted to spacer plates on each of the heat sinks, for a total of eight power amplifiers in all. (The power amplifiers are the same as those utilized in the Crown Broadcast 100, 250, 500, and 1000–watt transmitters.)

Power from the amplifiers is combined through a micro-strip combiner to convert from 50 Ω output impedance for each amplifier to an intermediate impedance and then return to the 50 Ω output at the Low Pass Filter. This technology eliminates tuning and adjustments throughout the 88–108 FM band and enables each amplifier to equally share the power load. The power combiner is also designed to allow a module to be disconnected from the combiner and removed without adversely affecting the impedance balance of the unit. With one module removed the impedance change allows the remaining modules to continue operation at approximately three-fourths of the full output power.

4.1.2 Power Combiner Board

There are four Power Combiner Boards; one attached to each of the four heatsinks overlapping the amplifiers. Each board takes the power from two amplifiers and combines it through a parallel quarter-wave transmission line transformer network. The power is then summed in a common point junction on the Output Combiner Board.

4.1.3 Backplane Assembly

The backplane assembly is located in the vertical center of the PA2000 behind the four power modules. The Backplane Assembly is the common connection point for the major sections of the transmitter. This assembly consists of the Input Divider Board, Output Combiner Board, and a Backplane Interconnect Board.

4.1.3.1 Backplane DC Interconnect Board

This board is located nearest the metal inner brace of the chassis. It distributes DC power to each of the four MOSFET amplifiers, provides the interconnections for control of the power supply, and enables connection to the remote control interface. The Backplane/DC Interconnect Board contains interconnections from the Control and Metering Board to the DC Fuse and Power Distribution Board, as well as power connections to the power amplifier modules.

4.1.3.2 Input Divider Board

The Input Divider Board is the middle board sandwiched between the Backplane DC Interconnect Board and the Output Combiner Board. It provides the power division and impedance transformation needed to supply proper drive to each of the eight amplifiers.

4.1.3.3 Output Combiner Board

The Output Combiner Board is located nearest the Output Filter It consists of a micro-strip transmission line that combines the output power from the four power amplifier modules so that ultimately, all the power comes together at one common point junction. Here the currents and voltages of all four power amplifier modules are in phase and producing equal RF output power. From this common point junction, the Output Combiner Board uses a second quarter-wave transformer to convert the output power to the 50–ohm impedance needed at the output of the unit.

4.1.4 Output Filter & Reflectometer

The Output Filter/Reflectometer is located behind the Backplane Assembly in the center of the PA2000. See the accompanying schematic in Section 6 for more information.

The ninth-order, elliptic, low-pass filter attenuates harmonics generated in the power amplifier. The capacitors for the filter are circuit board pads. The reflectometer uses printed circuit board traces for micro-strip transmission lines. Transmission line segments (with an impedance of about 100 ohms) on either side of a 50–ohm conductor provide sample voltages representative of the square root of forward and reverse power. DC voltages, representative of forward and reflected power, go through a bulkhead Filter Board to the Backplane/DC Interconnect Board, then to the Metering Board where they are processed for power control and metering and for SWR metering and protection.

4.1.5 Metering and Control Board

The Metering and Control Board is located above the upper left cavity. This board supplies readings of voltages and currents, and provides information on the operation of the amplifier.

The Local Power Adjust pot sets the upper limit (maximum) of RF power output. The on-board RAISE and LOWER push buttons and any external remote control of the power level is activated within that limit by placing the Local/Remote slide switch on the board into the Remote position. When a specific output power is set, the Metering and Control Board controls and maintains the setting keeping power constant. A long-life battery supplies power to retain the power setting after the amplifier is turned off.

This board also takes samples from the RF amplifier boards and PS1000 power supply and processes all the data. It provides SWR readings from the Output Filter and folds back the amplifier power if the SWR exceeds safe operating limits. Protection circuitry for overcurrent and overtemperature conditions is designed into this board as well, providing additional precaution against overheating. This board is fail-safe, like all the other circuit board components in the FM2000A and can be removed for repair/replacement if necessary.

4.1.6 DC Fuse and Power Distribution Board

This board is located above the right cavity over Power Modules A and B. The DC Fuse and Power Distribution Board takes power direct from the power supply through one 80–amp power line, divides it into eight separate DC power lines, and distributes it to the eight power amplifiers. Metering resistors in each of the eight power lines monitor the current drawn by each of the eight amplifiers to ensure proper function for monitor and control of the unit.

4.1.7 Cooling Fans

There are two cooling fans located in the back of the PA2000 powered by the PS2000. The fans operate at 24 volts and is rated at 235 cubic feet per minute. Cool air is drawn through the heatsinks where a flushing moves the air over the DC Distribution Fuse board, the Control and Metering Board, the Output Filter circuits, and then out through the air vents on the side panels. If a fan fails, the amplifier will fold back power to prevent overheating.

4.2 PS2000 Power Supply

The PS2000 supplies power to the PA2000 by converting single-phase 240 VAC into 50 VDC. The PS2000 is protected by a 20 A double-pole circuit breaker. This highly efficient power supply utilizes switching technology and is power factor corrected. The PS2000 consists of three printed circuit boards described below.

4.2.1 AC Input Board

The AC Input Board is located on the left side of the PS2000. AC power from the circuit breaker connects to the AC Input Board where it connects to a ±12 volt DC power supply and three relays. The ±12 volts is used to close the three relays when the DC Power Switch on the front panel is switched on. In addition, the ±12 volts are supplied to the PA2000 for use in the Control and Metering Board. The 240-volt AC input to the power supply is connected through a Hubble Twist Lock connector on the back panel to a 20–amp circuit breaker mounted inside the back panel.

When the power supply is turned on and enabled, the AC power comes through torroidal inductors which prevent harmonics and spurious products from feeding back into the AC power lines. The current flows from the inductors to a bridge rectifier that converts the current to DC Power, and from there to the PFC Switching Board where the rectified DC is filtered. The filtered DC power is then fed from the PFC Switching Board through an 80–turn boost inductor and back to the PFC Switching Board.

4.2.2 PFC (Power Factor Correcting) Switching Board

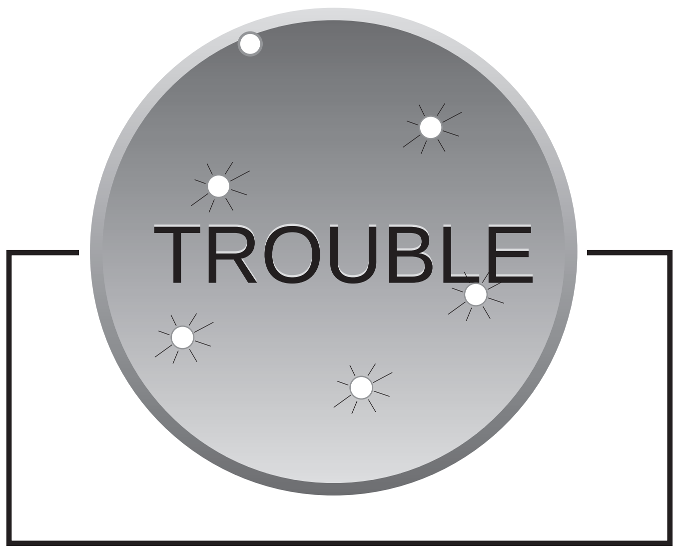
The PFC Switching Board is located directly behind the cooling fans (front panel) in the PS2000. This board takes the voltage from the Torroidal Boost Inductor and sends it to the Boost Switching Transistor. The switching transistor chops the DC input power at a 25 kHz rate. The chopped voltage is then rectified, filtered, and sent as DC voltage to a set of four transistors which form a second switching stage. The second switching stage chops the DC voltage at a 22.5 kHz rate. This chopped DC power is fed through a blocking capacitor to a transformer on the DC Output Board. The second switching stage controls the amount of power sent to the DC Output Board. This ensures that the transformer output voltage and current are correct for providing the selected RF output power to the amplifier.

4.2.3 DC Output Board

The DC Output Board is located in the back of the unit directly behind the PFC Switching Board. This board rectifies and filters the transformer output voltage once again to produce the clean DC power required for the power modules. The DC Output Board also provides the 24 volts that operate the cooling fans in both the PS2000 and the PA2000. There are two parallel paths from the DC Output Board, with half the power going through each set of output cables. These cables come together at the terminal in back of the unit providing the maximum output power of 50 volts at 60 amperes.

4.2.4 Cooling Fans

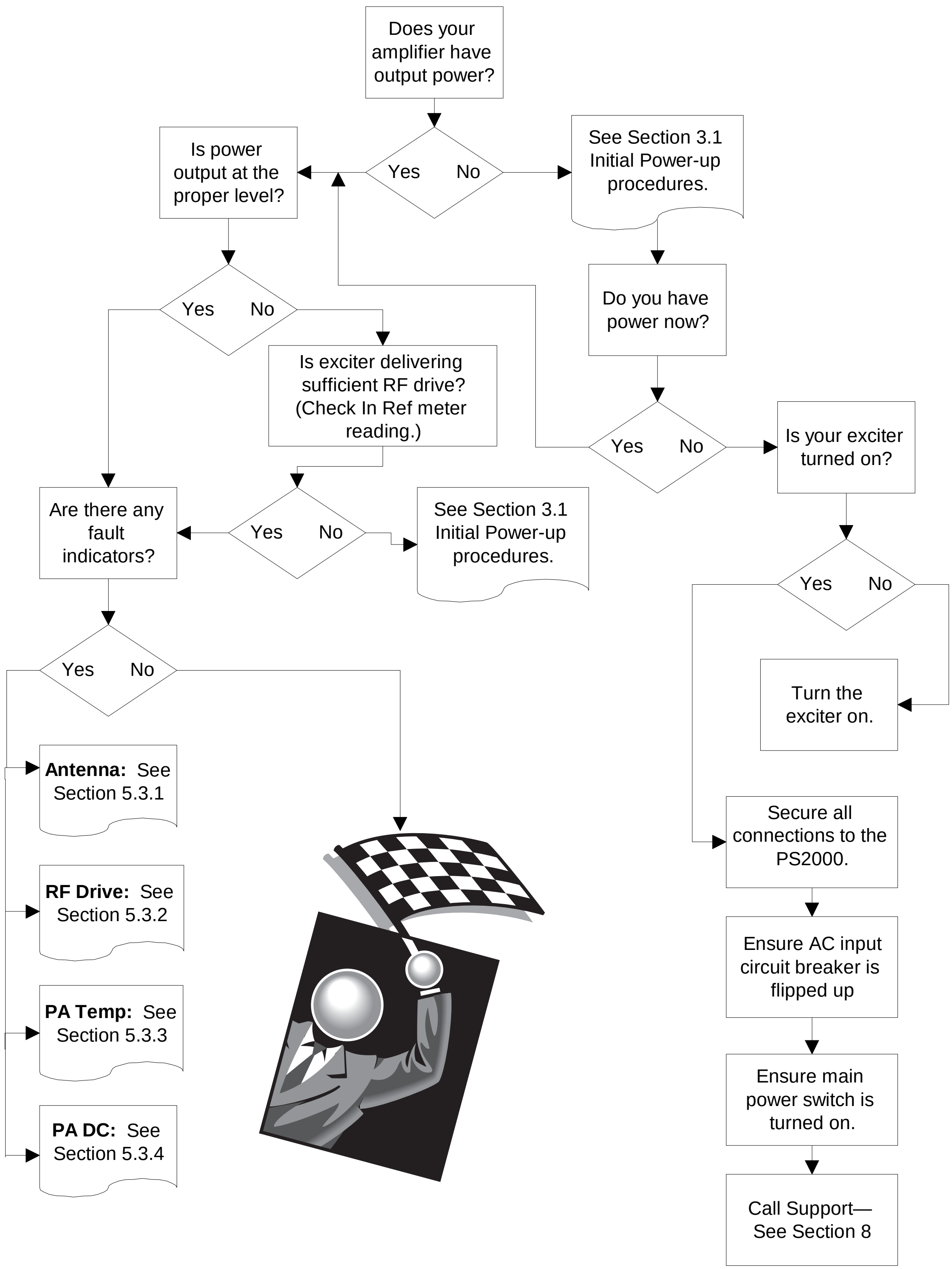
There are two cooling fans located in the front section of the PS2000. Their primary function is to cool the semiconductors used in the switching and rectifying process which are subject to high currents. The fans blow cool air through the heatsinks and out through the vents on the back and side panels of the PS2000. The fans have a dedicated circuit breaker located on the back panel of the power supply.



Section 5—Troubleshooting

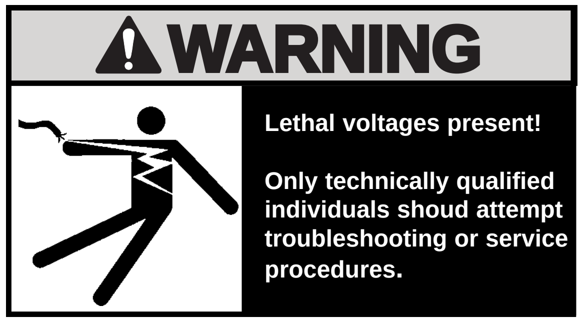
This section describes procedures for service personnel to diagnose and troubleshoot potential fault conditions in the power amplifier and power supply.

5.1 Troubleshooting Flow Chart Analysis



5.2 Digital Multimeter Parameters

The following procedures are general in nature; for in-depth service, and repair see the Service & Support section of this manual.



If any abnormal readings are displayed for any of the following parameters on the Digital Multimeter, try troubleshooting in the following manner:

5.2.1 In Ref (Input Drive Reference)

If this indication of drive level is not between 0.8 and 1.2 volts, then:

- ❑ Check the exciter to ensure proper power input level of 70–80 watts.
- ❑ Check RF input cable for secure connection.

5.2.2 SWR (Standing Wave Ratio)

If the SWR is over 1.5:1, then look for:

- ❑ effects of inclement weather such as icing on the antenna and feed line.
- ❑ for moisture in the feedline.
- ❑ insecure antenna connections.

5.2.3 ALC (Automatic Level Control)

If this indication is not between 4.00 and 6.00 volts for 2.2 kW output, then:

- ❑ Check for overheating (see PA Temp fault LED).
- ❑ Check for overcurrent (see PA DC fault LED).
- ❑ Check for high SWR (see Antenna fault LED).

5.2.4 Power Out

This reading is user adjustable, but for full output should read 2.20 for 2.2 kW.

- ❑ If lower than desired, check for proper input drive, and/or proper adjustment of the Local Power Control (see section 3.1 #6).

5.2.5 PA Temp

The meter should read between 35–50°C with an ambient temperature of 25°C. If temperature is 75°C or above, then check and do the following:

- ❑ Ambient temperature higher than 50°C; reduce temperature.
- ❑ Restricted air flow; remove any obstructions, clean dirty air filters by using mild detergent and warm water.
- ❑ Possible antenna mismatch; check for icing, moisture in the feedline, and secure antenna connections.
- ❑ Overcurrent: If PA DC fault indicator is flashing, monitor the current for a proper level—the total current and the current of individual Power Amps.

5.2.6 PA Voltage

Supply voltage to the RF power amplifiers should be 50 V. If it is not check:

- ❑ drive level to ensure proper power level input of 70–80 watts
- ❑ for high SWR
- ❑ for overcurrent; check PA DC fault indicator and if flashing, check current for proper levels (total and individual Power Amps)
- ❑ for overtemperature; ambient temperature higher than 50°C; reduce temperature. Check air flow; remove any obstructions and clean dirty air filters.

5.2.7 Tot Current

If total current reading is over 65 amperes, then check or do the following:

- ❑ Reduce power output; check all fault indicators and troubleshoot accordingly.
- ❑ If one or more of the 500–watt power modules has failed; replace.
- ❑ High SWR; check for icing, moisture in the feedline, and secure antenna connections.

5.2.8 PA1–8

If there is 2.5 amps or more difference between the individual PA current readings (7 to 9 amps typical), then check the following:

- ❑ Failed/faulty power module (reading directly correlates to failed power module); replace.
- ❑ Blown individual power amplifier fuses 1–8; replace as indicated by red LED.
- ❑ Reduced power output; check all fault indicators and troubleshoot accordingly.

5.3 Fault Indicators

If one of the LED fault indicators is illuminated red, troubleshoot using the following suggestions:

5.3.1 Antenna

Antenna mismatch.

- ❑ Effects from inclement weather conditions such as icing.
- ❑ Check for moisture in the feedline.
- ❑ Secure antenna connections.

5.3.2 RF Drive

Denotes lack of or insufficient drive level.

- ❑ Ensure proper drive level of 70–80 watts input power.
- ❑ Check RF input cable for secure connection.

5.3.3 PA Temp

Temperature has reached the internal preset limit for safe operation (75°C).

- ❑ Ambient temperature higher than 50°C; reduce temperature.
- ❑ Restricted air flow; remove any obstructions, clean dirty air filters by using mild detergent and warm water.
- ❑ Antenna mismatch; check for icing, moisture on the feedline, and secure antenna connections.
- ❑ Overcurrent; check PA DC fault indicator, if flashing monitor current for proper levels (total and individual Power Amps).
- ❑ Faulty DC Output Board; replace (see Section 7, Service & Support).
- ❑ Faulty or non-functioning cooling fan; determine the cause for malfunction in the following section.

5.3.3.1 Potential Causes for Non-functioning Cooling Fans

The PA2000 and the PS2000 have two cooling fans each. All fans are powered by the same circuit of the PS2000. There are two potential causes for a non-functioning fan or fans:

1. If a single fan does not operate, the fan is faulty and must be replaced. (See Section 7, Service & Support.)
2. If none of the fans operate, a blown circuit breaker, a short circuit in the PS2000, or a damaged winding on the main transformer of the DC Output Board (in the PS2000) is the cause. In this case, do one of the following:

a. The circuit breaker is located on the rear panel of the power supply. If the breaker has popped out, reset it by pushing it in. If the breaker continues to trip, check for a short circuit.

b. Check each fan with a volt-ohm meter by disconnecting and testing it for a short circuit. Replace the fan/fans as needed (see Section 7).

c. If none of the fans have short circuits, there is damage on the winding of the transformer. It will have to be replaced (see Section 7).

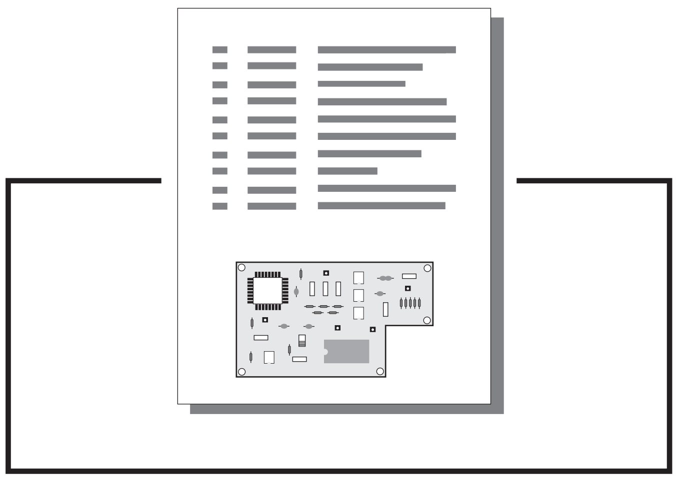
5.3.4 PA DC

Discrepancy in current between the individual amplifiers, or in total current.

- ❑ There is a difference of current greater than 2.5 amps between any one of the 4 individual amplifiers. This could occur as a result of a blown or faulty power module, or a blown fuse; replace as appropriate (see Section 7, Service & Support).
- ❑ There is too much total current—power foldback will occur above maximum total amperage of 65 amps due to some malfunction. For antenna mismatch check for arcing and moisture. Also, check output power for proper current; the RF detection circuit could malfunction causing an overcurrent situation.

5.3.5 Multiple Indicators

Call your Crown Broadcast service representative. See Section 7, Service and Support, for contact information.



Section 6—Reference Drawings

The illustrations in this section may be useful for making adjustments, taking measurements, troubleshooting, or understanding the circuitry of your RF power amplifier and power supply.

6.1 Views

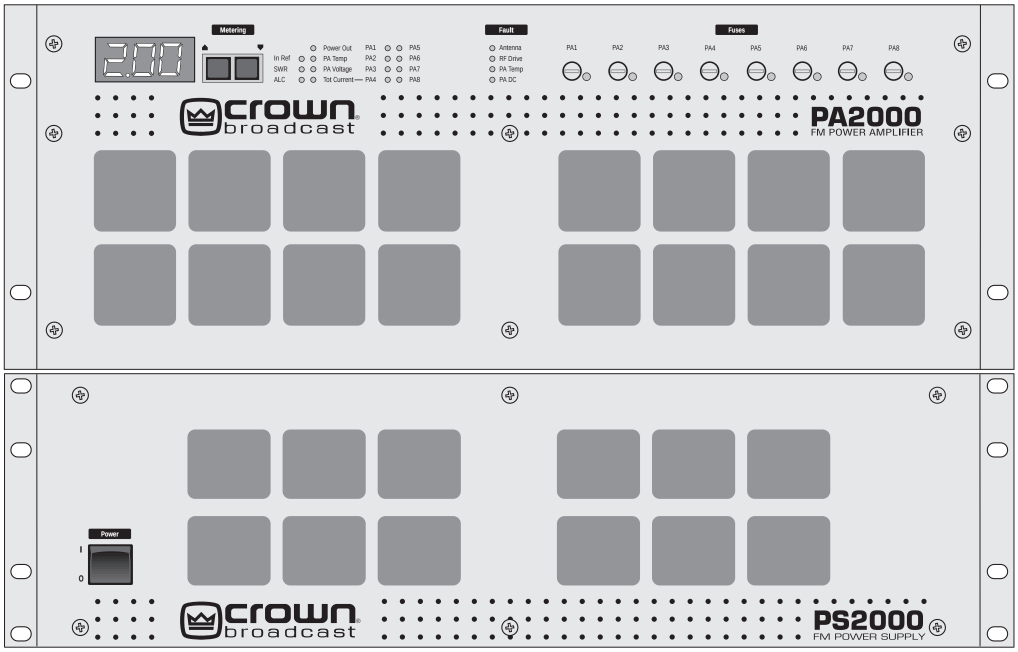


Illustration 6–1 Front View

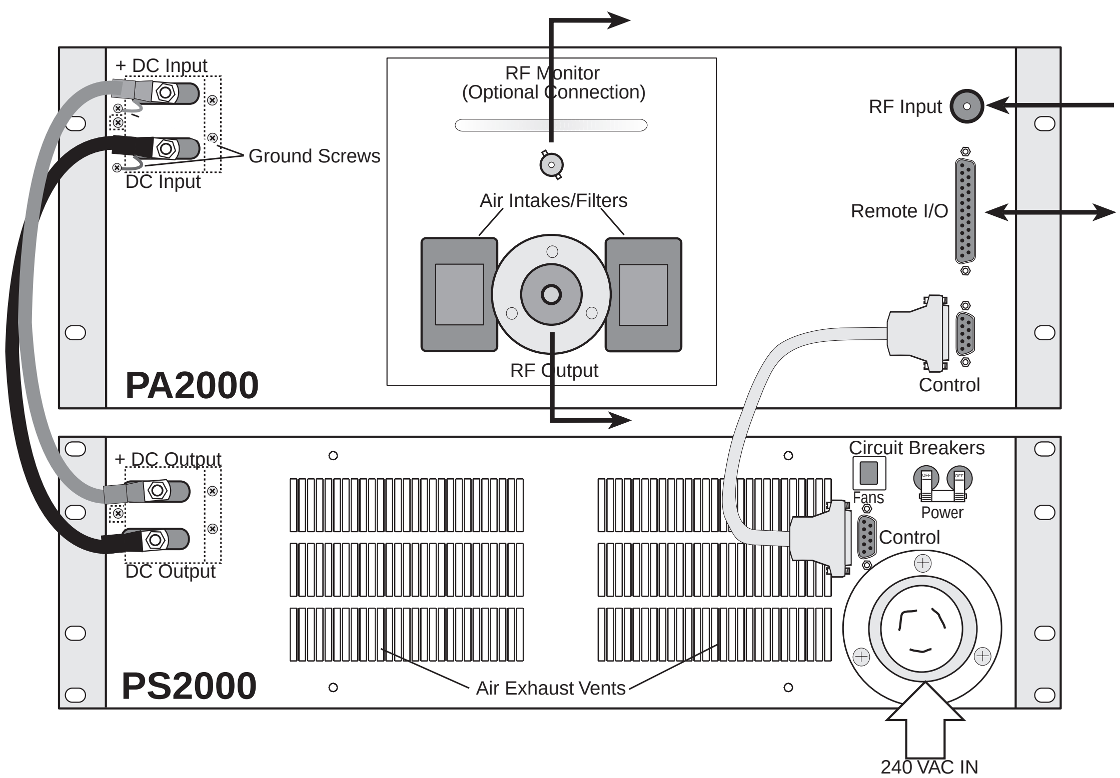


Illustration 6–2 Back View

6.2 Diagrams and Schematics

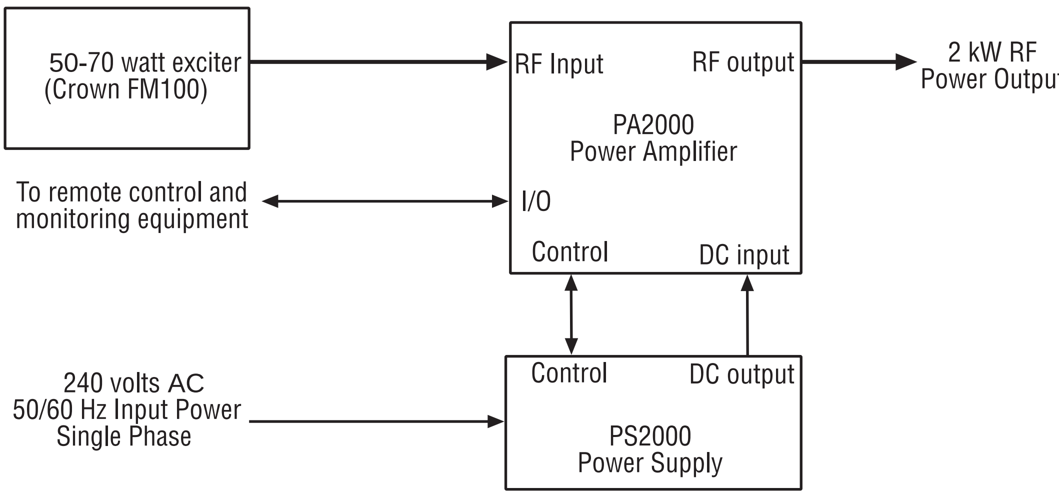


Illustration 6–3 FM2000A Block Diagram

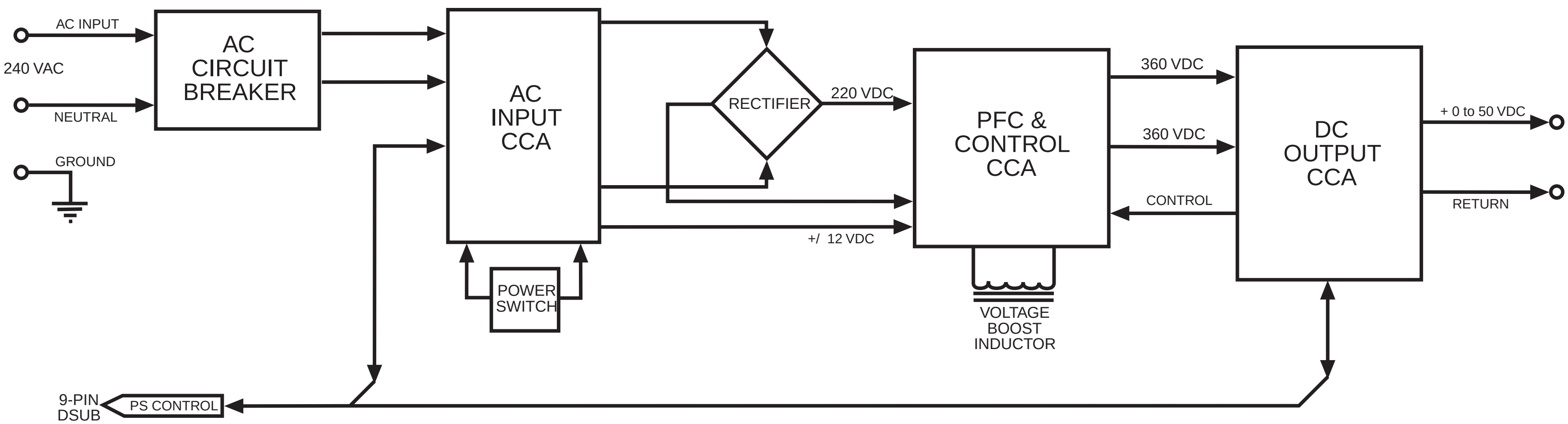
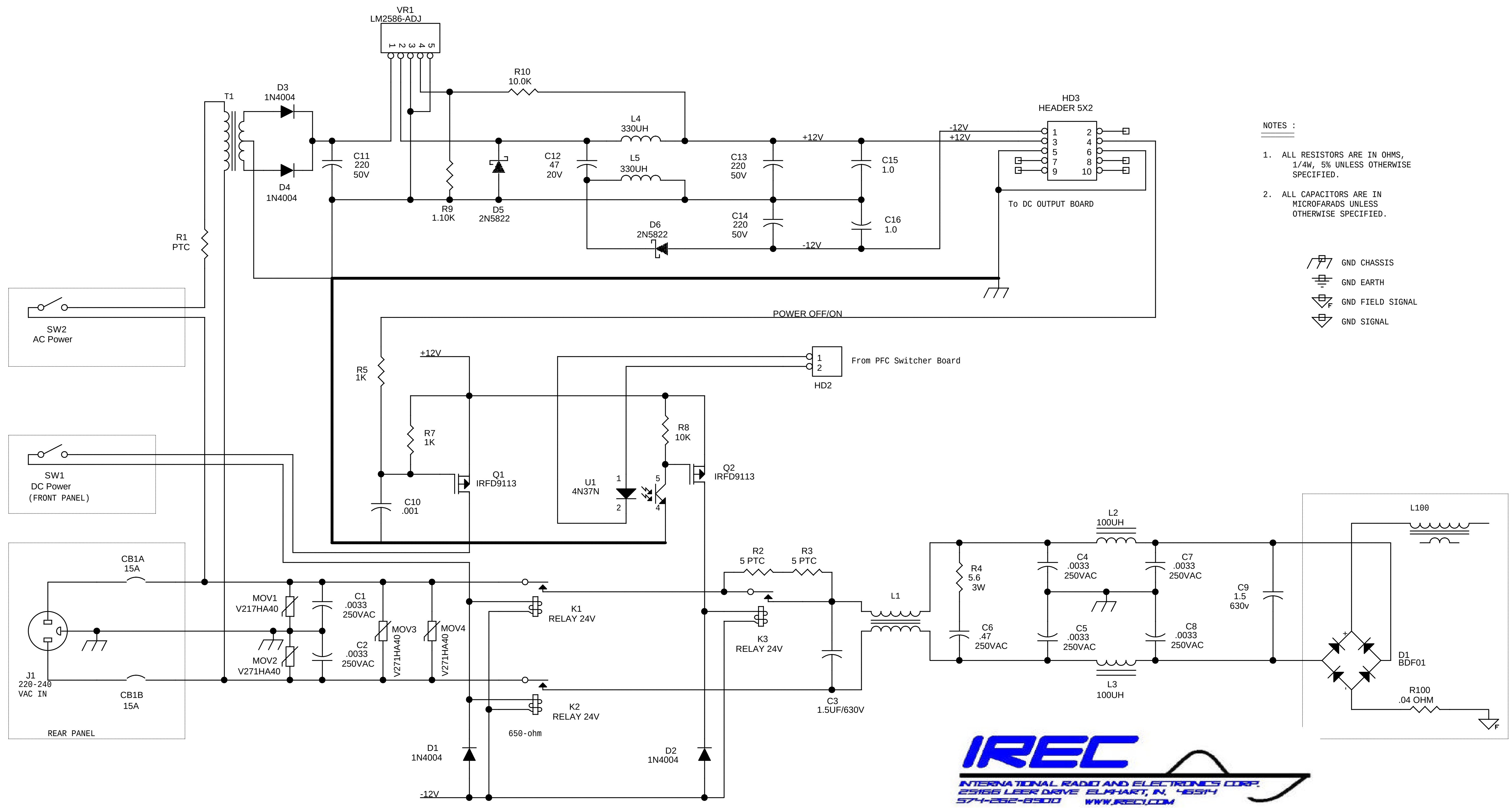


Illustration 6–4 PS2000 Block Diagram



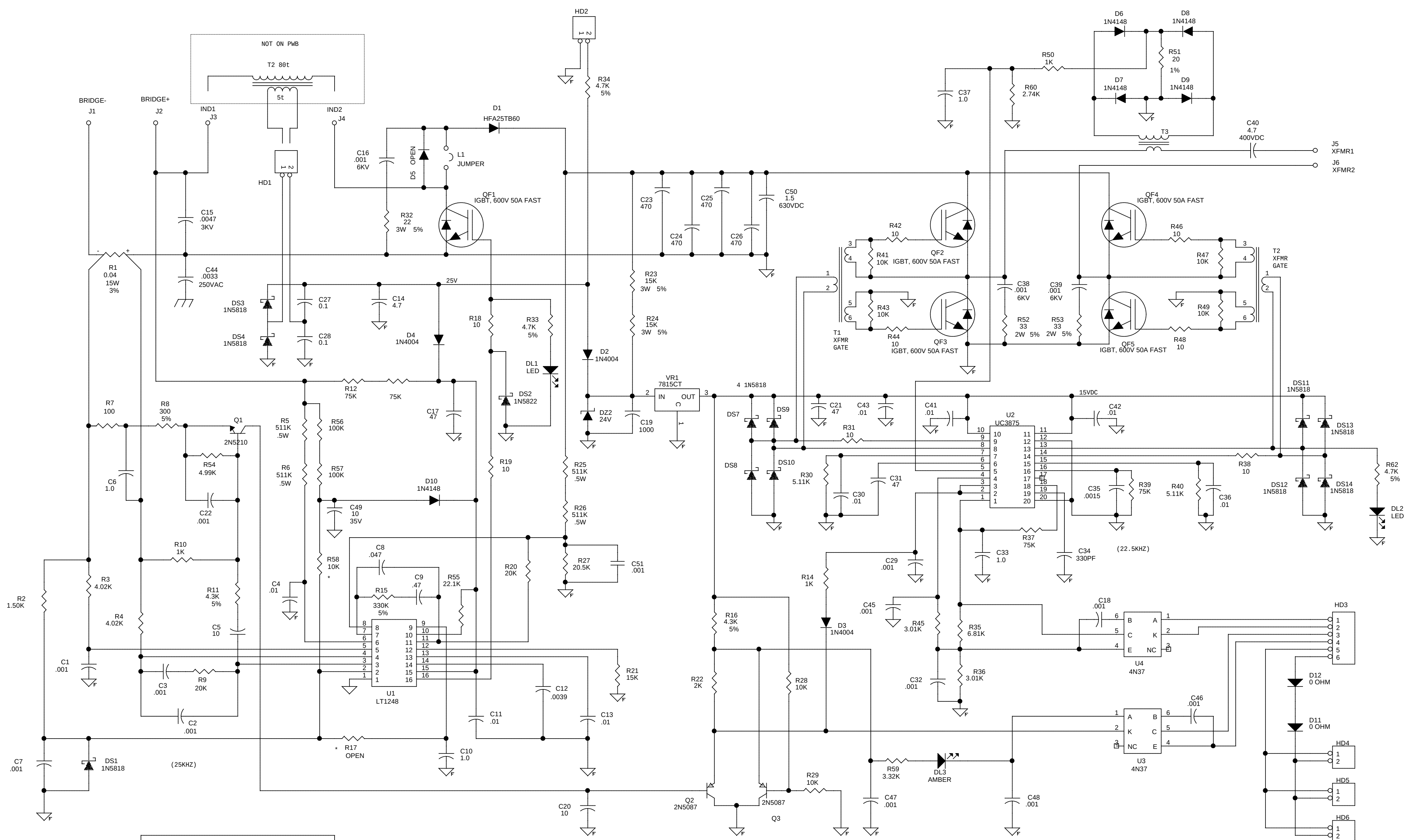
TITLE: SCH, FM2K POWER SUPPLY AC INPUT

SIZE	DWG. NO.	REV
B	Q43521-6	J

SCALE: NONE | PROJ NO. 103 | SHEET 10 OF 10

UNCONTROLLED

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* Install R58.

R58 for AC current foldback.

NOTES :

1. ALL RESISTORS ARE IN OHMS, 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

GND CHASSIS

GND FIELD SIGNAL

GND SIGNAL

⚠ DANGER

Field Signal Reference is connected to one side of the AC power. To prevent serious injury or death do not touch this point.

IREC

INTERNATIONAL RADIO AND ELECTRONICS CORP.
25166 LEER DRIVE ELKHART, IN. 46514
574-262-8900 www.irec.com

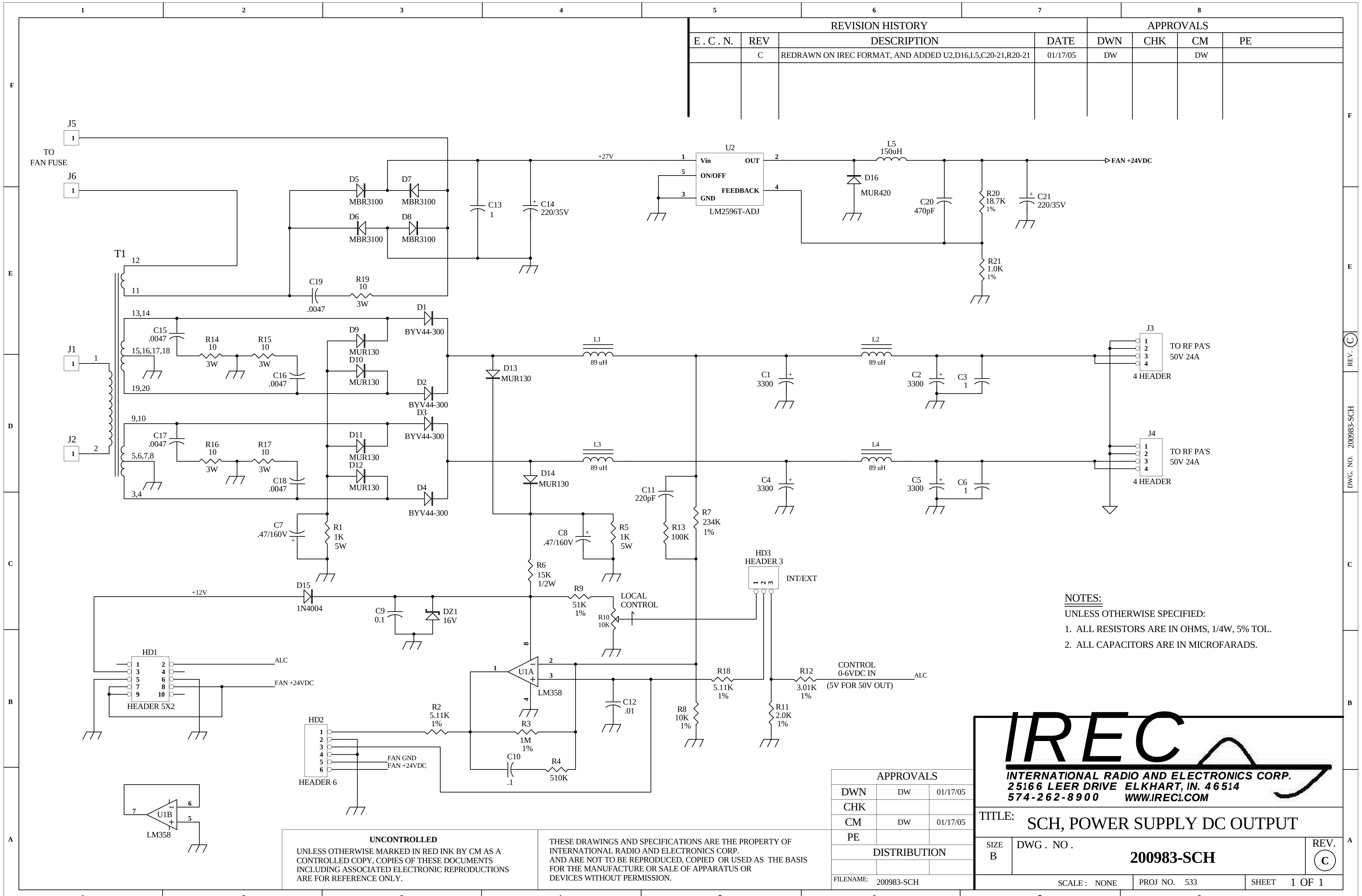
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TITLE: SCH, FM2K PWR SUP PFC SWITCHER

SIZE: C | DWG. NO.: Q43522-4 | REV: L

SCALE: NONE | PROJ NO. 103 | SHEET 10 OF 10


REVISION HISTORY
APPROVALS
E . C . N.
REV
DESCRIPTION
DATE
DWN
CHK
CM
PE
C
REDRAWN ON IREC FORMAT, AND ADDED U2,D16,L5,C20-21,R20-21
01/17/05
DW
DW
J5
TO FAN FUSE
J6
T1
J1
J2
U2
LM2596T-ADJ
Vin
OUT
ON/OFF
FEEDBACK
GND
+27V
L5
150uH
D16
MUR420
FAN +24VDC
C20
470pF
R20
18.7K
1%
C21
220/35V
R21
1.0K
1%
C13
1
C14
220/35V
D5
MBR3100
D7
MBR3100
D6
MBR3100
D8
MBR3100
C19
.0047
R19
10
3W
D1
BYV44-300
D2
BYV44-300
D3
BYV44-300
D4
BYV44-300
D9
MUR130
D10
MUR130
D11
MUR130
D12
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C15
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C16
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L1
89 uH
L2
89 uH
L3
89 uH
L4
89 uH
C1
3300
C2
3300
C3
1
C4
3300
C5
3300
C6
1
J3
4 HEADER
TO RF PA'S
50V 24A
J4
4 HEADER
TO RF PA'S
50V 24A
C7
.47/160V
R1
1K
5W
C8
.47/160V
R5
1K
5W
C11
220pF
R13
100K
R7
234K
1%
HD3
HEADER 3
INT/EXT
R6
15K
1/2W
+12V
D15
1N4004
C9
0.1
DZ1
16V
R9
51K
1%
R10
10K
LOCAL CONTROL
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% TOL.
2. ALL CAPACITORS ARE IN MICROFARADS.
HD1
HEADER 5X2
ALC
FAN +24VDC
U1A
LM358
C12
.01
R18
5.11K
1%
R12
3.01K
1%
CONTROL
0-6VDC IN
(5V FOR 50V OUT)
ALC
R8
10K
1%
R11
2.0K
1%
R2
5.11K
1%
R3
1M
1%
C10
.1
R4
510K
HD2
HEADER 6
FAN GND
FAN +24VDC
U1B
LM358
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APPROVALS
DWN DW 01/17/05
CHK
CM DW 01/17/05
PE
DISTRIBUTION
FILENAME: 200983-SCH
IREC
INTERNATIONAL RADIO AND ELECTRONICS CORP.
25166 LEER DRIVE ELKHART, IN. 46514
574-262-8900 WWW.IREC1.COM
TITLE: SCH, POWER SUPPLY DC OUTPUT
SIZE B
DWG . NO . 200983-SCH
REV. C
SCALE : NONE
PROJ NO. 533
SHEET 1 OF 1
REV. C
DWG. NO. 200983-SCH
B_L_SHT1_A.DOT REV. A

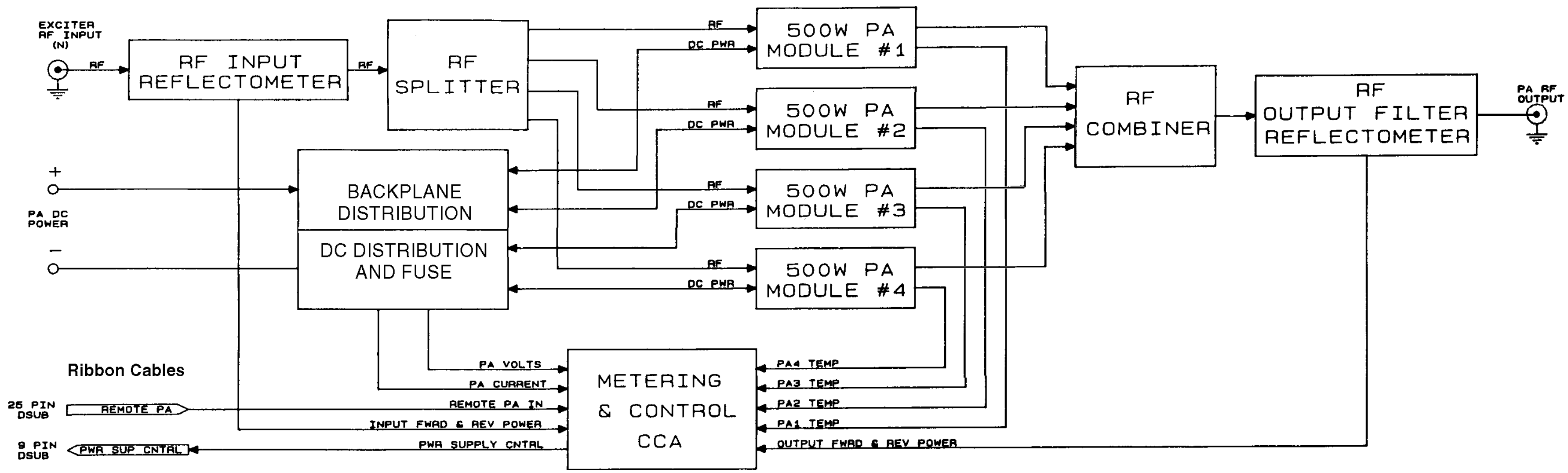
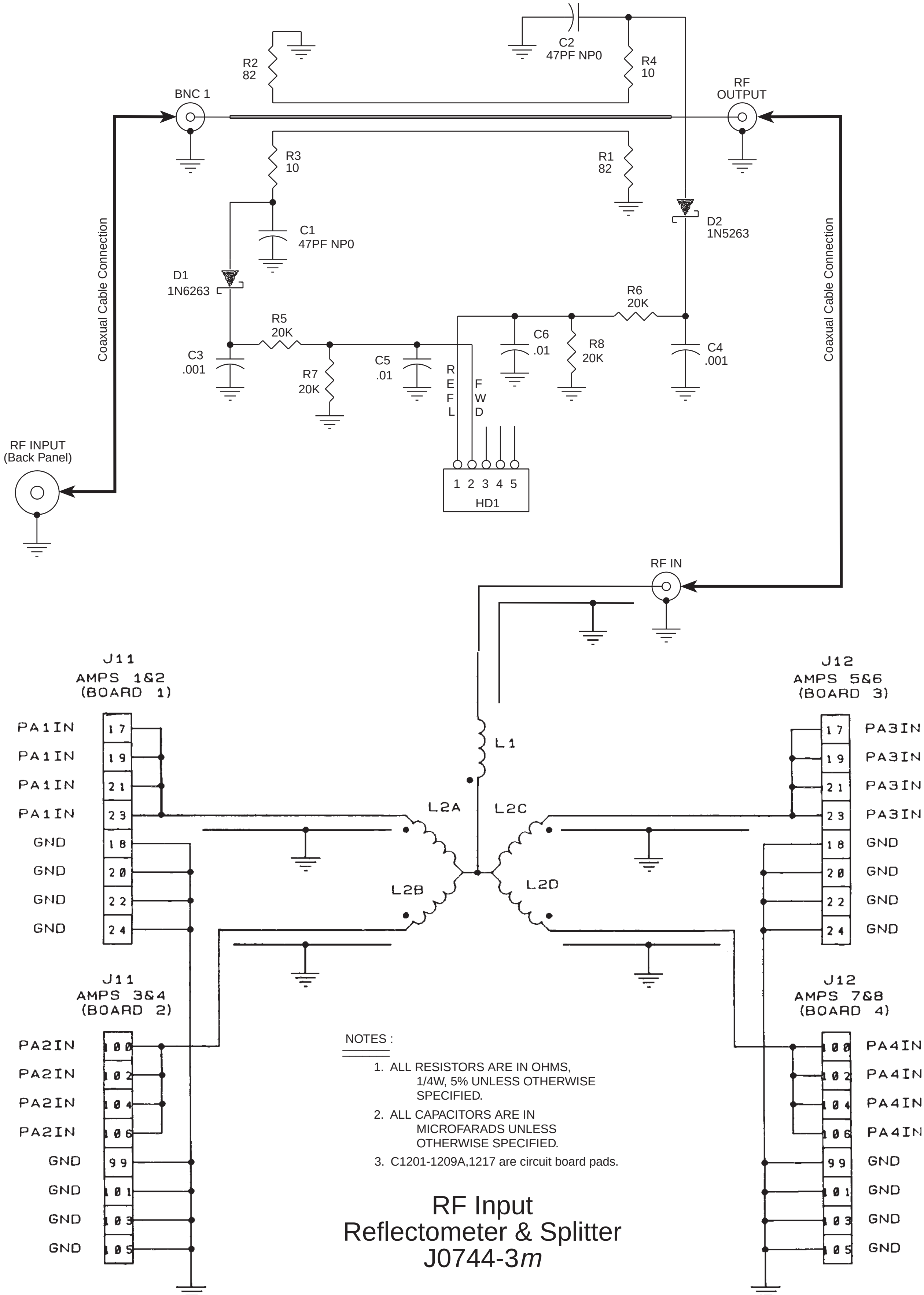


Illustration 6–5 PA2000 Block Diagram

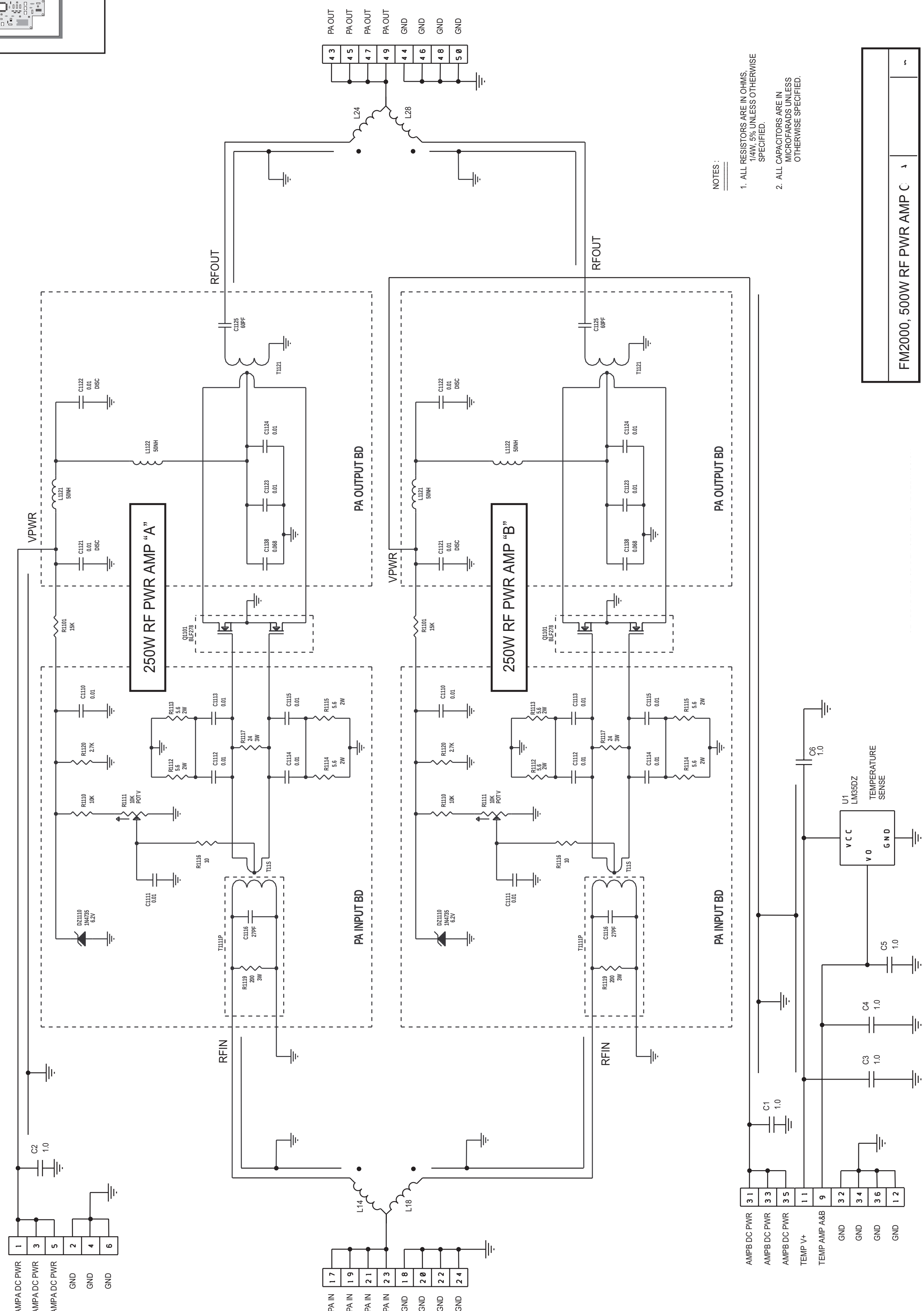


NOTES :

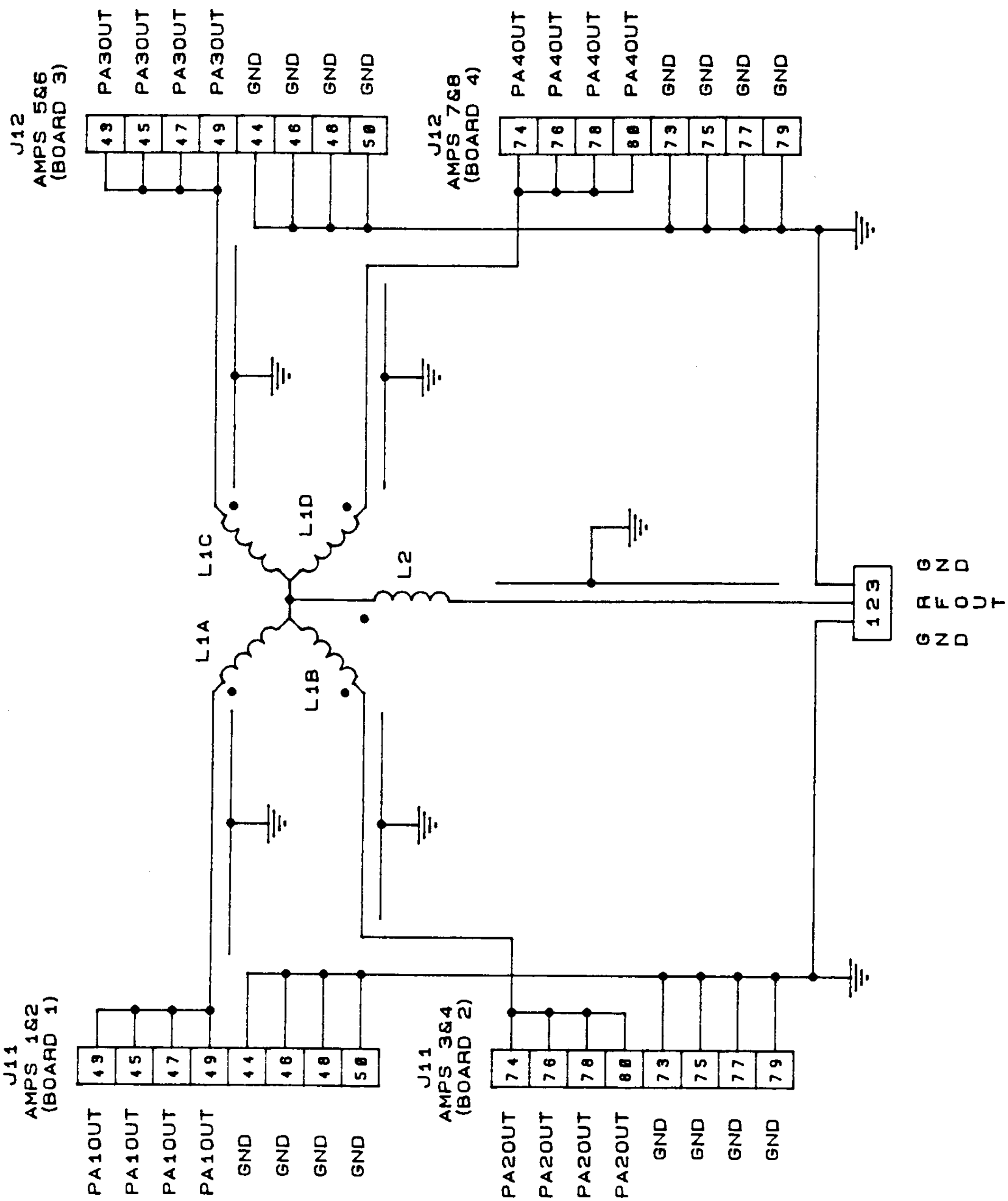
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. C1201-1209A,1217 are circuit board pads.

RF Input
Reflectometer & Splitter
J0744-3*m*

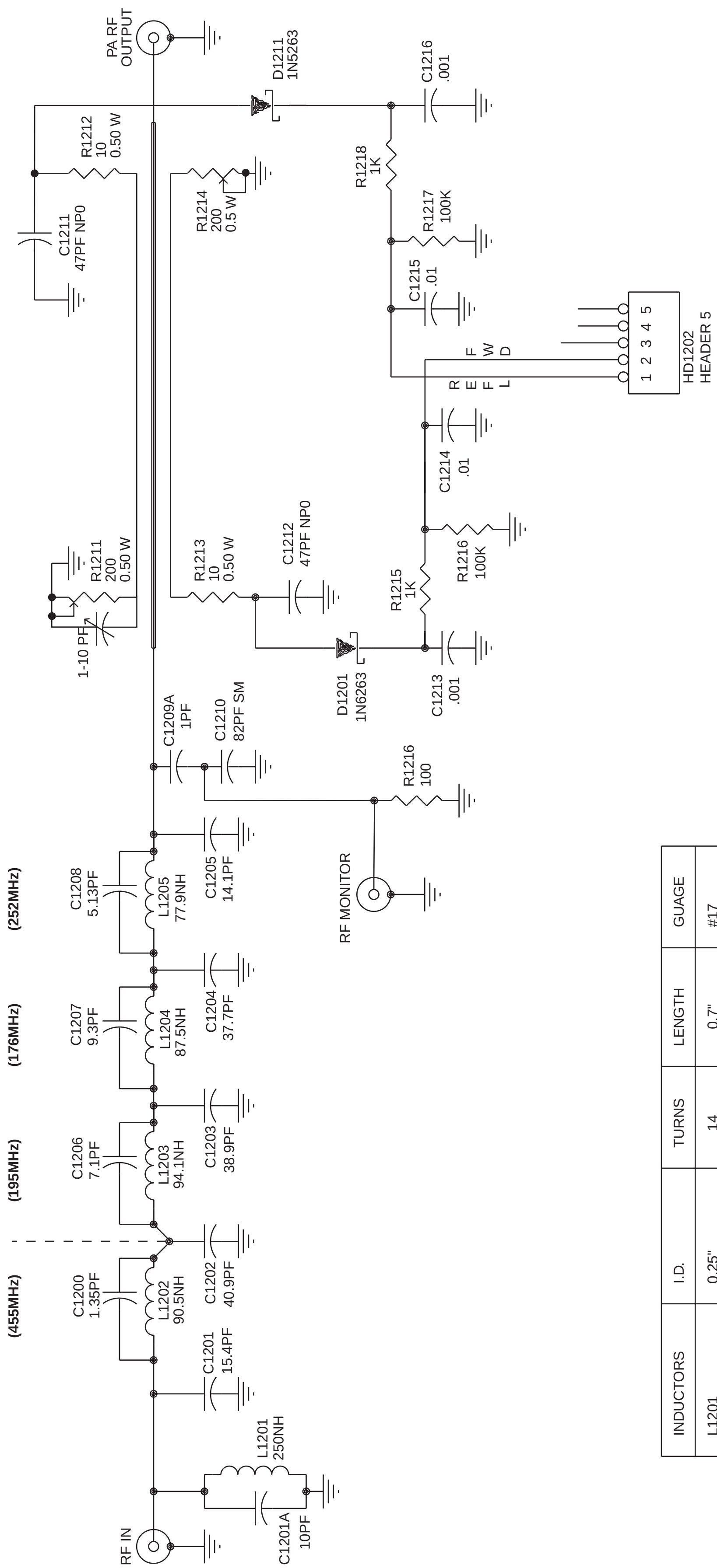
PA2000 RF Input



500 W Power Amp



RF Output Combiner



RF Output
Filter & Reflectometer
J0750-0

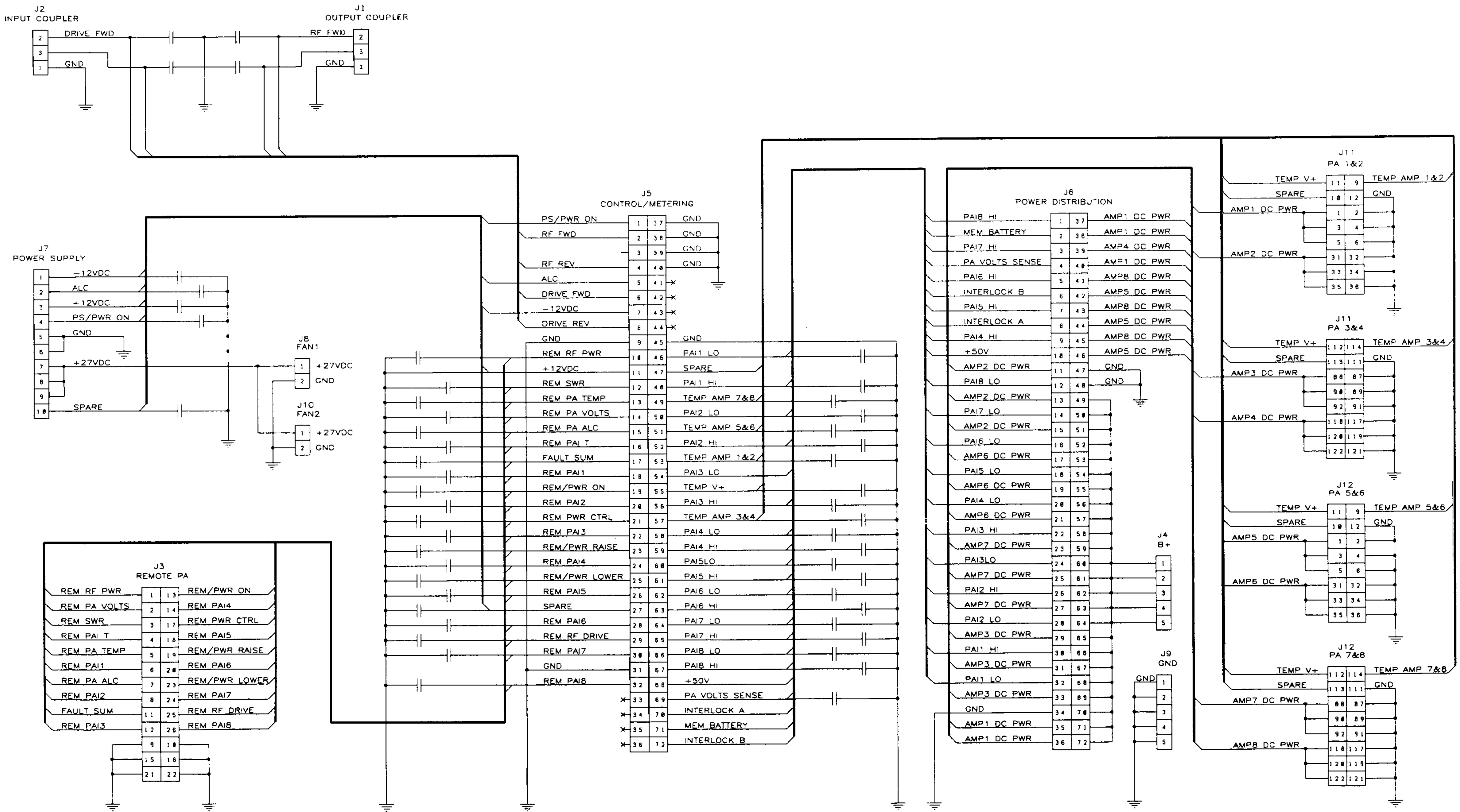
NOTES :

1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. C1201-1209A,1217 are circuit board pads.

INDUCTORS	I.D.	TURNS	LENGTH	GUAGE
L1201	0.25"	14	0.7"	#17
L1202	0.5"	3	0.6"	#12
L1203	0.5"	3	0.5"	#12
L1204	0.5"	3	0.7"	#12
L1205	0.4375"	3	0.6"	#12

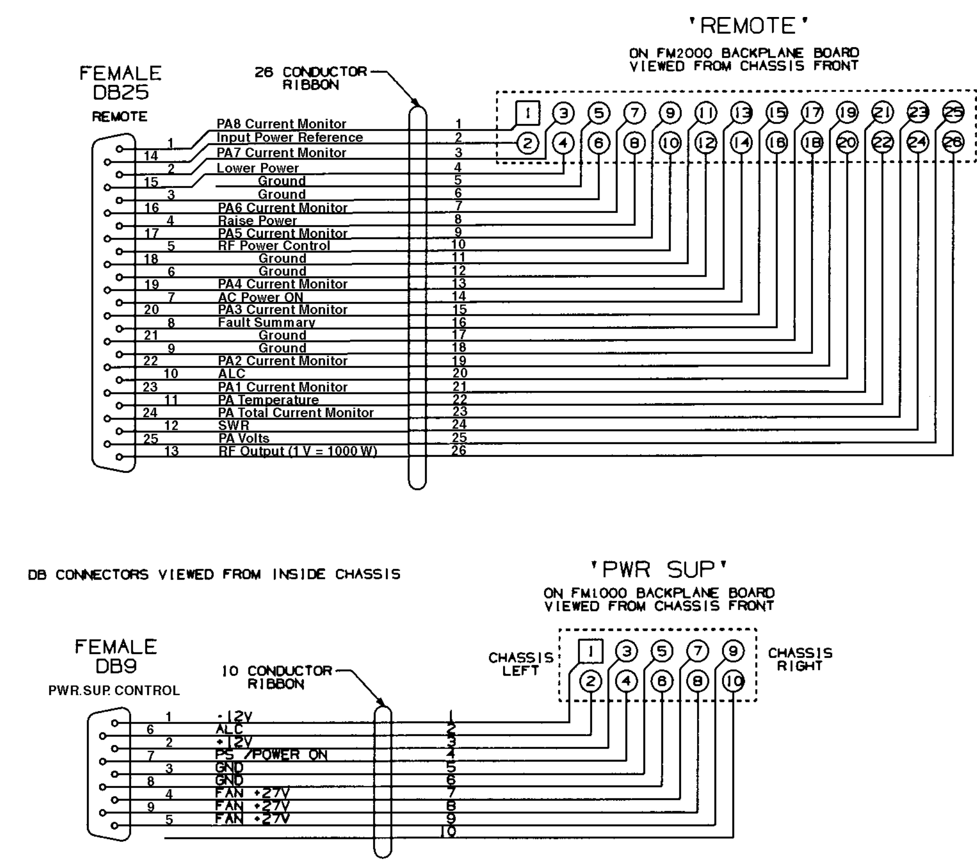
EXACT COIL LENGTHS ARE FACTORY-SET.

RF OUTPUT FILTER & REFLECTOMETER

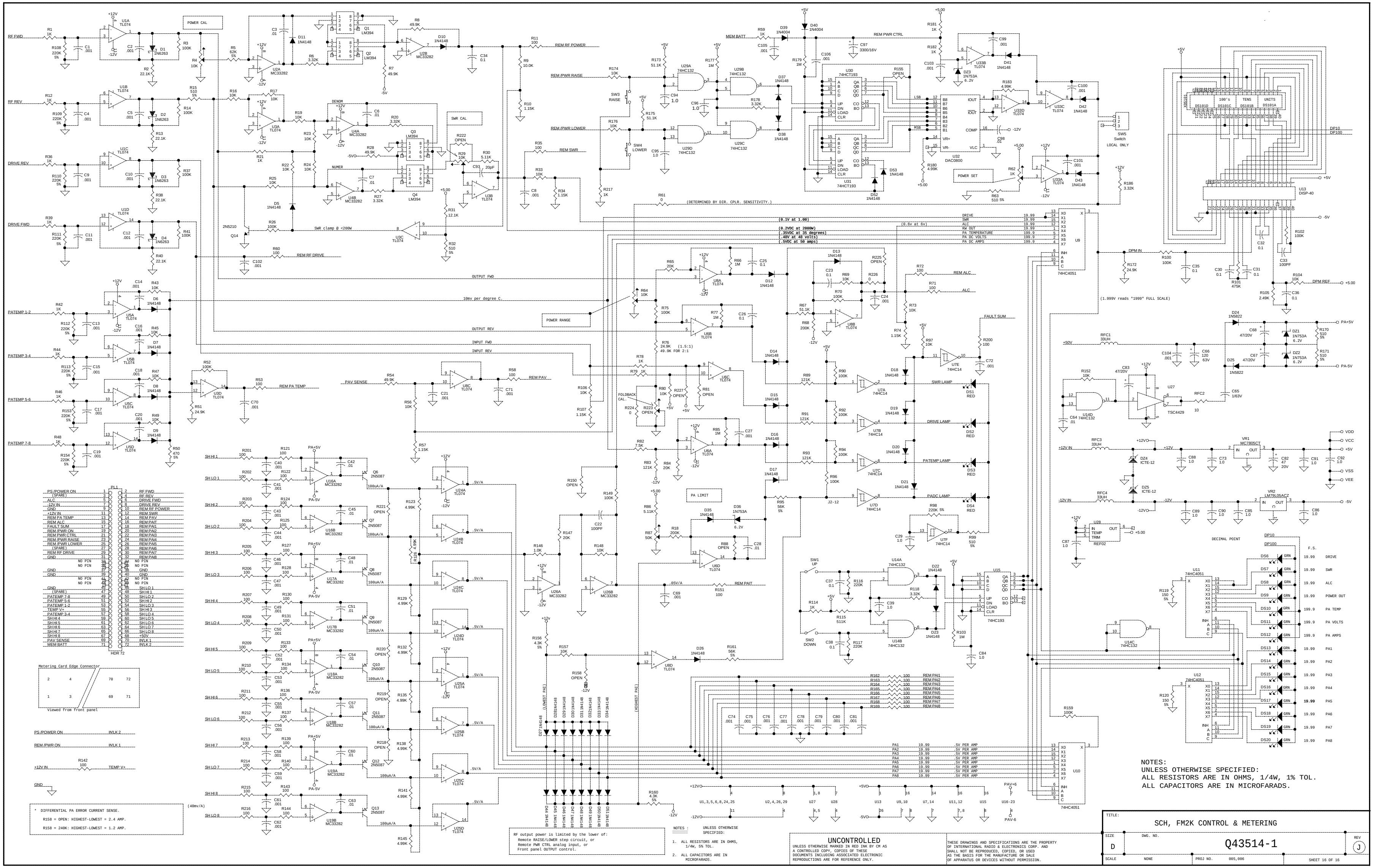


Note: All bypass capacitors are 0.01 mf

Ribbon Cables and Connectors



Ribbon Cables and Connectors


SCH, FM2K CONTROL & METERING
Q43514-1
SIZE D
REV J
SCALE NONE
PROJ NO. 005,006
SHEET 16 OF 16
UNCONTROLLED
UNLESS OTHERWISE MARKED IN RED INK BY CM AS A CONTROLLED COPY, COPIES OF THESE DOCUMENTS INCLUDING ASSOCIATED ELECTRONIC REPRODUCTIONS ARE FOR REFERENCE ONLY.
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF INTERNATIONAL RADIO & ELECTRONICS CORP. AND SHALL NOT BE REPRODUCED, COPIED, OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS OR DEVICES WITHOUT PERMISSION.
NOTES:
UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE IN OHMS, 1/4W, 1% TOL.
ALL CAPACITORS ARE IN MICROFARADS.
NOTES : UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% TOL.
2. ALL CAPACITORS ARE IN MICROFARADS.
RF output power is limited by the lower of:
Remote RAISE/LOWER step circuit, or
Remote PWR CTRL analog input, or
Front panel OUTPUT control.
* DIFFERENTIAL PA ERROR CURRENT SENSE.
R158 = OPEN: HIGHEST-LOWEST = 2.4 AMP.
R158 = 240K: HIGHEST-LOWEST = 1.2 AMP.
Metering Card Edge Connector
Viewed from front panel
(DETERMINED BY DIR. CPLR. SENSITIVITY.)
(1.999V reads "1999" FULL SCALE)
DECIMAL POINT

Notes:



Section 7—Service and Support

We understand that you may need various levels of support or that the product could require servicing at some point in time. This section provides information for both of these scenarios.



7.1 Service

The product warranty (see opposite page) outlines our responsibility for defective products. Before returning a product for repair or replacement (our choice), call our Customer Service department using the following telephone number:

(866) 262-8915

Our Customer Service Representative will give you further instructions regarding the return of your product. Use the original shipping carton or a new one obtained from Crown. Place shipping spacers between the slide-out power amplifier assembly and the back panel.

Please fill out the Factory Service Instructions sheet (page 7–5) and include it with your returned product.

7.2 24–Hour Support

In most instances, what you need to know about your product can be found in this manual. There are times when you may need more in-depth information or even emergency-type information. We provide 24–hour technical assistance on your product via a toll telephone call.

For **emergency help** or **detailed technical assistance**, call

(866) 262-8915

You may be required to leave a message at this number but your call will be returned promptly from our on-call technician.

7.3 Spare Parts

To obtain spare parts, call **Crown Broadcast Sales** at the following number.

(866) 262-8915

You may also write to the following address:

Service Manger

International Radio and Electronics Company, Inc.

25166 Leer Drive

Elkhart, Indiana, U.S.A. 46514-5425

Crown Broadcast Three Year Limited Product Warranty

SUMMARY OF WARRANTY

Crown Broadcast, IREC warrants its broadcast products to the ORIGINAL PURCHASER of a NEW Crown Broadcast product, for a period of three (3) years after shipment from Crown Broadcast. All products are warranted to be free of defects in materials and workmanship and meet or exeed all specifications published by Crown Broadcast. Product nameplate with serial number must be intact and not altered in any way. This warranty is non - transferable. This warranty in its entirety is the only warranty offered by Crown Broadcast. No other warranties, expressed or implied, will be enforceable.

EXCLUSIONS

Crown Broadcast will not warranty the product due to misuse, accident, neglect and improper installation or operation. Proper installation included A/C line surge supression, lightning protection and proper grounding of the entire transmitter, and any other recommendations designated in the Instruction manual. This warranty does not extend to any other products other than those designed and manufactured by Crown Broadcast. This warranty does not cover any damage to any accessory such as loads, transmission line or antennas resulting from the use or failure of a Crown Broadcast transmitter. Warranty does not cover any loss of revenue resulting from any failure of a Crown Broadcast product, act of God, or natural disaster.

Procedure for Obtaining Warranty Service

Crown Broadcast will repair or service, at our discretion, any product failure as a result of normal intended use. Warranty repair can only be performed at our plant facility in Elkhart, Indiana USA or at a factory authorized service depot. Expenses in remedying the defect will be borne by Crown Broadcast, including two-way ground transportation cost within the continental United States.
Prior to returning any product or component to Crown Broadcast for warranty work or repair, a Return Authorization (RA) number must be obtained from the Crown Broadcast Customer Service Department. Product must be returned in the original factory pack or equivalent. Original factory pack materials may be obtained at a nominal charge by contacting Crown Broadcast Customer Service. Resolution of the defective product will be made within a reasonable time from the date of receipt of the defective product.

Warranty Alterations

No person has the authority to enlarge, amend, or modify this warranty, in whole or in part. This warranty is not extended by the length of time for which the owner was deprived the use of the product. Repairs and replacement parts that are provided under the terms of this warranty shall carry only the unexpired portion of the warranty.

Product Design Changes

Crown Broadcast reserves the right to change the design and manufacture of any product at any time without notice and without obligation to make corresponding changes in products previously manufactured.

Legal Remedies of Purchaser

This written warranty is given in lieu of any oral or implied warranties not covered herein. Crown Croadcast disclaims all implied warranties including any warranties of merchantability or fitness for a particular purpose.

Crown Broadcast
25166 Leer Drive
Elkhart, Indiana 46514-5425
Phone 574-262-8900 Fax 574-262-5399 www.crownbroadcast.com

Notes:

Factory Service Instructions

To obtain factory service, complete the bottom half of this page, include it with the unit, and ship to:

International Radio and Electronics Company, Inc.

25166 Leer Drive

Elkhart, Indiana, U.S.A. 46514-5425

For units in warranty (within 3 years of purchase from any authorized Crown Dealer): We pay for ground UPS shipments from anywhere in the continental U.S. and Federal Express Second Day service from Hawaii and Alaska to the factory and back to you. Expedited service/shipment is available for an additional charge. You may ship freight collect (COD for cost of freight) or forward your receipt for shipping charges which we will reimburse. We do not cover any charges for shipping outside the U.S. or any of the expenses involved in clearing customs.

If you have any questions about your Crown Broadcast product, please contact Crown Broadcast Customer Service at:

Telecphon: (574) 262-8900

Fax: (574) 262-5399

Name: ______________________ **Company:** ______________________

Shipping Address: ______________________

Phone Number: ______________________ **Fax:** ______________________

Model: __________ **Serial Number:** __________ **Purchase Date:** __________

Nature of the Problem

(Describe the conditions that existed when the problem occurred and what attempts were made to correct it.)

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Other equipment in your system: ______________________

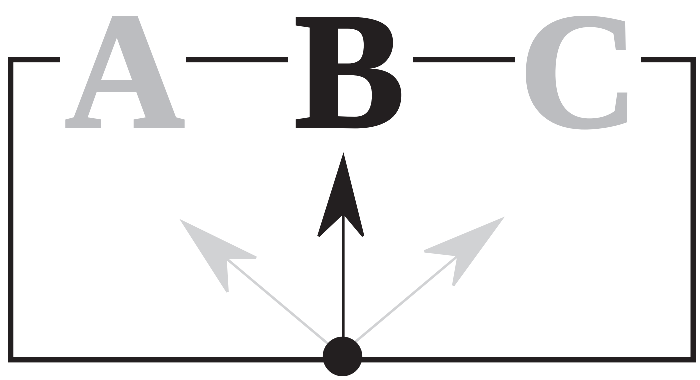
If warranty has expired, payment will be: ☐ Cash/Check ☐ VISA ☐ Mastercard ☐ COD

☐ Please Quote before servicing

Card Number: ______________ Exp. Date: ________ Signature: ______________

Return Shipment Preference if other than UPS Ground: ☐ Expedite Shipment ☐ Other__________

ENCLOSE WITH UNIT—DO NOT MAIL SEPARATELY



Glossary

The following pages define terms and abbreviations used throughout this and other Crown Broadcast manuals.

AF	Audio Frequency; the frequencies between 20 Hz and 20 kHz in the electromagnetic spectrum.
ALC	Automatic Level Control
AM	Amplitude Modulation; the process of impressing information on a radio-frequency signal by varying its amplitude.
bandwidth	The range of frequencies available for signalling.
BCD	Binary-Coded Decimal; a digital system that uses binary codes to represent decimal digits.
BFO	Beat Frequency Oscillator
BNC	A bayonet locking connector for miniature coax; said to be short for Bayonet-Neill-Concelman.
broadband	As used in the FM transmitter, refers to the entire audio spectrum as opposed to the spectrum influenced by the pre-emphasis; also called "Wideband."
carrier	A continuous signal which is modulated with a second, information-carrying signal.
crosstalk	In FM broadcasting, this term generally refers to the interaction between the main (L+R) and the subcarrier (L–R) signals as opposed to "separation" which generally refers to leakage between left (L) and right (R) channels.
density (program)	A high average of modulation over time.
deviation	The amount by which the carrier frequency changes either side of the center frequency.
DIP	Dual In-line Package; term used to describe an IC or socket that has two parallel rows of pins.
distortion	The unwanted changes in signal wave shape that occur during transmission between two points.
DPM	Digital Panel Meter
EPROM	Erasable Programmable Read Only Memory
ESD	Electrostatic Discharge; a discharge that is potentially distructive to sensitive electronic components.

exciter	(1) A circuit that supplies the initial oscillator used in the driver stage. (2) A transmitter configuration which excludes stereo generation and audio processing.
FET	Field-Effect Transistor
frequency synthesizer	A circuit that generates precise frequency signals by means of a single crystal oscillator in conjunction with frequency dividers and multipliers.
FM	Frequency Modulation; the process of impressing information on a radio signal by varying its frequency.
FSK	Frequency Shift Keying; an FM technique for shifting the frequency of the main carrier at a Morse code rate. Used in the on-air identification of frequencies.
gain reduction	The process of reducing the gain of a given amplifier.
harmonics	Undesirable energy at integral multiples of a desired, fundamental frequency.
HF	High Frequency; Frequencies in the 3.0 to 30.0 MHz range.
Highband	Frequencies affected by the pre-emphasis.
IC	Integrated Circuit
I/O	Input/Output
LED	Light-Emitting Diode
modulation	The process by which a carrier is varied to represent an information-carrying signal.
MOSFET	Metal Oxide Semiconductor Field Effect Transistor; a voltage-controlled device with high input impedance due to its electrically isolated gate.
nearcast	A transmission within a localized geographic area (ranging from a single room to a several kilometers).
PA	Power Amplifier

PAI	Power Amplifier Current
PAV	Power Amplifier Voltage
pilot	A 19–kHz signal used for stereo transmissions.
pre-emphasis	The deliberate accentuation of the higher audio frequencies; made possible by a high-pass filter.
processing	The procedure and/or circuits used to modify incoming audio (keeping its level around 75 kHz deviation) to make it suitable for transmission.
receiver	An option which adds incoming RF capability to an existing transmitter. See also "Translator."
RF	Radio Frequency; (1) A specific portion of the electromagnetic spectrum between audio-frequency and the infrared portion. (2) A frequency useful for radio transmission (roughly 10 kHz and 100,000 MHz).
SCA	Subsidiary Communications Authorization; see "subcarrier."
S/N	Signal to Noise
spurious products	Unintended signals present on the transmission output terminal.
stability	A tolerance or measure of how well a component, circuit, or system maintains constant operating conditions over a period of time.
stereo pilot	See "pilot."
stereo separation	The amount of left-channel information that bleeds into the right channel (or vice versa).
subcarrier	A carrier signal which operates at a lower frequency than the main carrier frequency and which modulates the main carrier.
suppression	The process used to hold back or stop certain frequencies.

SWR Standing-Wave Ratio; on a transmission line, the ratio of the maximum voltage to the minimum voltage or maximum current to the minimum current; also the ratio of load impedance to intended (50 ohms) load impedance.

THD Total Harmonic Distortion

translator A transmitter designed to internally change an FM signal from one frequency to another for retransmission. Used in conjunction with terrestrial-fed networks.

satellator A transmitter equipped with an FSK ID option for rebroadcasting a satellite-fed signal.

UHF Ultra High Frequency; frequencies in the 300 to 3000 MHz range.

VCO Voltage-Controlled Oscillator

VHF Very High Frequency; frequencies in the 30 to 300 MHz range.

VSWR Voltage Standing-Wave Ratio; see "SWR."

Wideband See "broadband."

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